

Science

The American Midland Naturalist

Founded by J. A. Nieuwland, C.S.C.

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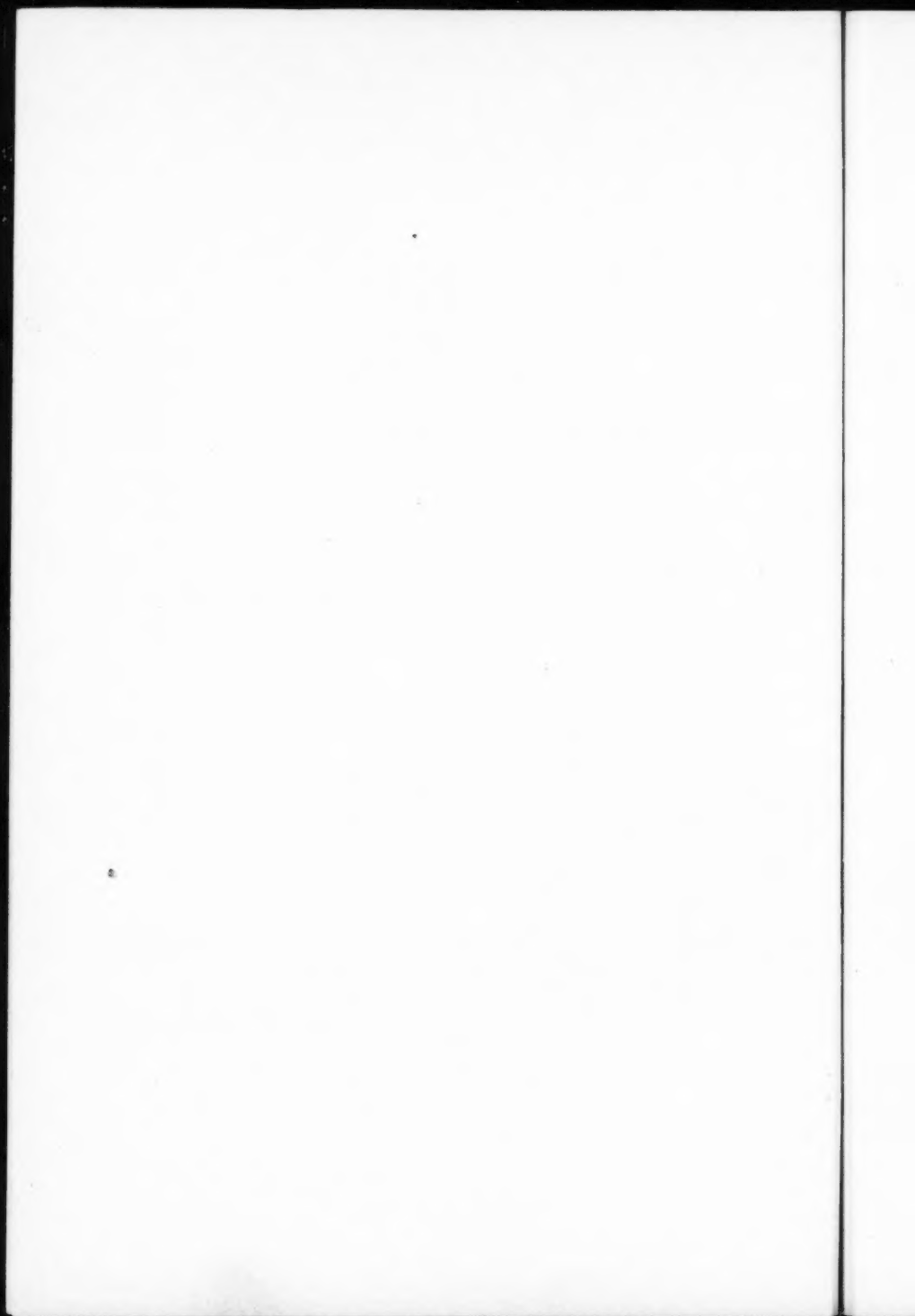
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Vol.

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The American Midland Naturalist

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JULY, 1945

No. 1

The Nearctic Species of Tendipedini

[Diptera, Tendipedidae (= Chironomidae)]

Henry K. Townes, Jr. *

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Scope

This paper contains a taxonomic treatment of the adult midges belonging to the tribe Tendipedini of the family Tendipedidae (= Chironomidae) occurring in the United States, Canada, Alaska, and Greenland. These species have formerly been included in the genera *Chironomus*, *Pseudochironomus*, *Pentapedilum*, and a few sometimes in *Tanytarsus*.

The Tendipedini comprise most of the larger and commoner species of Tendipedidae. They may be distinguished from other members of the family by the fact that the fore basitarsus is longer than the fore tibia (rarely only 0.95± as long as the fore tibia), the medio-cubital cross vein is absent, and the wing surface is usually not covered with hairs (macrotrichia). The few species of Tendipedini that have hair on the wing surface have a marginal fringe of long hairs on the squama. Other characters for distinguishing the Tendipedini are given in the keys on pages 12 to 14. Persons not certain of the family position of their specimens should consult the figures of wings on plates 19, 20, and 24. Insects with the type of wing venation figured are certain to belong to the Tendipedidae. The biting midges which were formerly often included in this family as the subfamily Ceratopogoninae are considered to constitute a distinct family, the Heleidae (= Ceratopogonidae).

Only the adults are treated in this paper, though there are a few notes on the ecology of the immature stages. The keys and descriptions are designed to make the identification of both sexes possible wherever distinguishing characters for both could be found, but many species are at present distinguishable only on male genitalia, and often where female specific characters are

* Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, United States Department of Agriculture.

known these are of such a nature as to make their inclusion in a key impractical. A study of the female genitalia should contribute something to our knowledge of the relationships and ability to identify the species, though it does not seem probable that these will prove to be of as much taxonomic value as the male genitalia.

It has been possible to define clearly most of the species treated, but for certain of them in the subgenera *Tendipes*, *Stictochironomus*, *Tribelos*, and *Tanytarsus*, and in the genera *Paratendipes* and *Glyptotendipes*, the specific limits could not be defined as well as might be desired. Although it seems certain that most of the species recognized in these more difficult groups are discrete, better characters are needed for easier and more uniformly accurate determinations and for the description of certain species which were left out of the revision for lack of adequate material and taxonomic characters for their clear distinction. It is hoped that these species will soon receive further study. Perhaps an investigation of the biology and morphology of the immature stages would give a better understanding of them.

The classification used is a modification of that of Goetghebuer in E. Lindner's *Die Fliegen der Palaearktischen Region*, 1937, parts 107 and 109. It is radically different from the one commonly used in American literature in that the old genus *Chironomus* is divided into a number of genera and subgenera and that the presence or absence of hair on the wing membrane is no longer used as a primary generic distinction. The classification proposed here is based to a large extent upon characters of the immature stages, as these give valuable aid in evaluating the generic significance of adult characters.

The Nearctic species of *Tendipedini* were first brought together in a revision by Johannsen in 1905.¹ In 1915 Malloch² gave an excellent account of the species he found in Illinois. In 1938 Johannsen³ gave an account of the immature stages of the Nearctic species and assigned many of them to the groups used by European authors. Aside from these three papers of major interest there have been a number of descriptions of new species, local lists giving distributional data, papers on the biology and immature stages of one or a few species, and some taxonomic notes by Johannsen.

In the present paper 201 species are treated, of which 104 are new, 15 are described species not previously reported from the Nearctic region, and 82 are species previously described or reported from our fauna. Probably another hundred species remain to be collected and described. The territory least known is the southern border of the United States. New York, Illinois, the District of Columbia, Ontario, and Michigan are the regions most thoroughly collected and together give a good picture of the fauna of the northeastern United States and southeastern Canada. In the Arctic regions a number of new species of the subgenus *Tendipes* are to be expected. Surprisingly few strictly Western species have been encountered. It is possible that, as in most other groups, many species are restricted to the Rocky Mountain region, but the material that I have seen indicates that the *Tendipedini* is an exception in this

1 Bull. N. Y. State Mus. 1905, 86:186-250, 286-287, 293-294.

2 Bull. Ill. State Lab. Nat. Hist. 1915, 10:414-484, 492-493, 500-501.

3 Mem. Cornell Univ. Agr. Exp. Sta. (1937) 1938, 210: 16-50.

respect. Thirty-three of our species are known to occur in the Palaearctic region. It is probable that a considerably larger number are of Holarctic distribution, and more comparisons should be made between the species of the two faunas. In the preparation of this paper the possibilities for comparison were restricted by a dearth of Palaearctic material. Some of our species are Neotropical in affinities and a number are known to extend into the Neotropical region.

Material Studied

The study was begun and based largely on the Townes Collection. Loans from other collections have added a number of species and provided longer series for study. Without this additional material, the paper would be much less complete. In addition to the types, the material used is in the following institutions and private collections. These are listed in approximate order of the amount of material from each that has been studied, and after each is given in parentheses the abbreviation used in the distributional data under each species. Under the species, when a list of collections containing material is given, the collections are arranged in order according to the number of specimens in each, those with the largest number of specimens first.

- H. K. and M. C. Townes, Takoma Park, Md. (Townes).
United States National Museum, Washington, D. C. (USNM).
Cornell University, Ithaca, N. Y. (Cornell).
Canadian National Collection, Ottawa, Ontario (CNC).
University of Minnesota, St. Paul, Minn. (Minn.)
J. G. Rempel, Regina College, Regina, Saskatchewan (Rempel).
O. A. Johannsen, Cornell University, Ithaca, N. Y. (Johannsen).
Museum of Comparative Zoology, Harvard University, Cambridge, Mass. (Harvard)
R. R. Dreisbach, Midland, Mich. (Dreisbach).
University of Kansas, Lawrence, Kans. (Kans.)
C. W. Sabrosky, Michigan State College, East Lansing, Mich. (Sabrosky).
R. B. Miller, University of Alberta, Edmonton, Alberta (Miller).
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Utah State Agricultural College, Logan, Utah (Utah).
California Academy of Sciences, San Francisco, Calif. (Calif. Acad.).
Oregon State College, Corvallis, Oreg. (Oreg.).
Massachusetts State College, Amherst, Mass. (Mass.)
Colorado State College, Fort Collins, Colo. (Colo.).
North Carolina Department of Agriculture, Raleigh, N. C. (N.C.).
American Museum of Natural History, New York, N. Y. (Amer. Mus.).
H. L. Felton, location of collection unknown (Felton).
Illinois State Natural History Survey, Urbana, Ill. (Ill.).
University of Alberta, Edmonton, Alberta (Alta.).
L. J. Milne, location of collection unknown (Milne).
S. W. Jewett, location of collection unknown (Jewett).
Ohio State University, Columbus, Ohio (Ohio).

All pertinent types in North American collections have been seen except for the types of *Chironomus fulvipilus* Rempel and of *Chironomus colei* Malloch. Dr. Rempel has compared specimens with his type of *C. fulvipilus* for me. I have studied the paratype of *Chironomus colei*. The interpretations of species described as European are based on the papers of Edwards, Goetghebuer, and Kruseman. About 1931, a collection containing 51 named British species of Tendipedini was received from F. W. Edwards by the United States

National Museum. Most of the comparisons with Palaearctic species were done with the aid of this material. Professor O. A. Johannsen has examined all types of Nearctic species that could be found in European museums and has given free use of his notes on them. He has also examined the material in the Vienna museum that was sent by Say to Wiedemann. Wiedemann received specimens of *Chironomus stigmaterus*, *C. lobiferus*, *C. festivus*, *C. lineatus*, and *C. modestus* from Say. Although this material gives a good idea of Say's species, it is not certain that it is type material.

Acknowledgments

This study was begun during the summers of 1934 through 1938 while I was employed by the Biological Survey of the New York State Conservation Department to study aquatic insects. During this period a large amount of material was collected and many species were reared. Additional material was collected as various later opportunities presented themselves. Taxonomic studies were pursued while I was a graduate student at Cornell University and while employed by Syracuse University, by Cornell University, and in the Division of Insect Identification of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. The work has had lengthy interruptions which have affected the uniformity of the drawings and have probably affected its quality in other ways. Except in the Division of Insect Identification, the work was done during spare time, which was sometimes scarce and sometimes had to be shared with other research projects.

My wife (Dr. Marjorie Chapman Townes) has made most of the drawings, collected much of the material, and assisted in many of the more routine parts of the research. In a sense she is to be considered co-author. Professor O. A. Johannsen has generously given the benefit of his years of study in the group and of his fine grasp of the literature. For several years I had the opportunity of asking his advice and help frequently. Dr. R. B. Miller, of the University of Alberta, had written a taxonomic treatment of the tendipedid fauna of Costello Lake, Algonquin State Park, Ontario, which included the description of new species. Upon learning of my own work, Dr. Miller did not publish his paper and permitted me to use his material. Many entomological friends have collected specimens for me or have turned over their private collections for study. Some of the most valuable material has come from them.

Local Lists

Although the bibliographies under the species have been made reasonably complete in other respects, references giving only distributional data are omitted. A study of the material upon which most of these records were based has shown that the determinations are unreliable. An example of what may be expected in the accuracy of published records may be given by summarizing the determinations of material in the C. W. Johnson collection at Harvard University. This collection is the basis for most of the determinations and records in the New Jersey lists of insects and other regional lists which Mr. Johnson wrote. There were 28 determined species of Tendipedini in the collection, of which 13 were correctly determined, 10 incorrectly determined, and under the other 5 specific labels were mixed series. In order to check the accuracy of certain records in the New York State list of insects (Mem. Cornell Univ. Agr. Exp. Sta. 1928, 101:712-714), the specimens in the M. C. Van Duzee collection which were the bases for the records of *Chironomus albipennis*, *C. brevitibialis*, *C. fasciventris*, *C. griseopunctatus*, *C. naevus*, *C. nubeculosus*, and *C. stigmaterus*, were borrowed from the California Academy of Sciences. All 7 of the species were misdetermined. Examination of the material in the American Museum of Natural History which was the

basis for Mrs. Slosson's records for Mt. Washington, N. H., and for Dr. Curran's records for Tuxedo Park, N. Y., showed that these records also contain many misdeterminations. It seems needless to repeat or to attempt to correct individual records in local lists, as most of the extant material upon which they are based has been restudied and reported correctly, it is hoped, in this paper.

In the case of species known from the Palaearctic as well as the Nearctic regions, only the original description and first correct generic placement are given from the Palaearctic literature. Persons seeking information on the biology of these species would do well to consult the Palaearctic literature further.

Explanation of Terminology

The *antennal ratio* is a figure expressing the length of the last segment of the male flagellum divided by the combined length of the rest of the flagellar segments. Measurements for this ratio were taken with an ocular micrometer in a low power binocular microscope on dried specimens whose flagella were moderately straight. When available, at least three specimens of each species were measured, and the ratio given is an average. The antennal ratio is subject to a normal variation of about 15 percent in each direction from the figure given. As a rule, smaller specimens of a species have a lower ratio than do larger specimens; and smaller species have a lower ratio than do larger, closely related species.

The female flagellum has either five or six apparent segments, depending upon whether the first and second segments are fused, or separated by an articulation.

The *frontal tubercles* are a pair of hemispherical, conical, or cylindrical protuberances on the frons just above the bases of the antennae (fig. 260).

The *leg ratio* is a figure expressing the length of the fore basitarsus divided by that of the fore tibia. Measurements for this ratio were taken with an ocular micrometer in a low power binocular microscope on dried specimens. When available, at least three specimens of each species were measured and the ratio given is an average. The leg ratio is subject to a normal variation of about 10 percent in each direction from the figure given. As a rule, smaller specimens of a species have a higher ratio than do larger specimens; and smaller species have a higher ratio than do larger closely related species. The leg ratio of females is approximately equal to that of males of the same species.

The *tibial combs* are the tibial spurs modified into comb-like structures. Each comb usually has a strong projecting point, called the *spine*, which is homologous with the point of the original spur. See the figures of them on plates 23 and 24 (figs. 251-258).

The *scale* of the fore tibia is a projecting flange on the inner apical margin of the fore tibia. Usually it has an apical point or spine (figs. 246-250). Its shape and armature provide important generic characters.

The *tarsal beard* is a fringe or whorl of unusually long divergent hairs on the fore tibia and tarsus of some males. It is never present in females. Specimens with a very dense tarsal beard have the segments bearing the beard somewhat swollen.

The *wing length* is the length of the fore wing from base to apex. Measurements were taken from dried male specimens with a calibrated ocular micrometer in a low power binocular microscope. When available, at least three averaged-sized specimens were measured, and the figure given is an average. Females, being bulkier than males, have wings a little longer and considerably broader than those of males. The wing measurement is given as an index of size. It is a more reliable index than the body length of dried specimens.

The term *squama* is applied to the same structure as in other Diptera—a lobe on the extreme posterior basal part of the wing. Its chief taxonomic importance is that in some species and genera the marginal fringe of long hairs, normally present on the squama, is lacking.

The Comstock-Needham system of naming wing veins is used. A figure with the veins labeled is given on plate 24 (fig. 259).

The terminology of the male genitalia is explained by the labeled figure on plate 24 (fig. 261). In the genus *Pseudochironomus* there is a pair of additional appendages, the *ventral appendages*, situated ventrally between the bases of the coxites (figs. 1 to 10). There are ventral appendages also in *Paratendipes* (figs. 18-23). The *anal point* is a sclerotized median prolongation of the ninth tergite (see fig. 261), while the *superior*, *inferior*, and *ventral appendages* are lobe-like outgrowths of the *coxite* (fig. 261). The anal point and the appendages of the coxite are independent developments in the Tendipedidae and are not homologous with similar structures in other families. A sclerotized penis is not present. The term "coxite" is used for part of the genitalia because this structure is analogous, but not necessarily homologous, with the coxa of the insect leg. The application of many terms in insect morphology (head, mandible, wing, scale, tarsus, femur, coxa, etc.) is based on analogy rather than homology with similar structures in other animals, and objections to the term coxite because of uncertain homology should not be heeded if the term is otherwise suitable. The drawings of genitalia of each genus, with very few exceptions, are drawn to the same scale in order to give an idea of relative size. The various scales used in making the drawings are given in the explanation of the plates.

Variations in Color

The color in some species is variable, though in most it is relatively constant. Variations are due almost entirely to differences in the degree of dark pigmentation rather than to differences in pattern. Occasional species (*Microtendipes pedellus*, *Tanytarsus jucundus*, and *Polypedilum fallax*) may be dimorphic or polymorphic in one sex.

It seems to be a very general rule among the Tendipedini that specimens that develop at lower temperatures have more dark pigmentation than do specimens of the same species that develop at higher temperatures, though not all color variation can be explained on this basis. The differences in pigmentation between early spring and midsummer specimens from the same body of water are often striking. Similarly, there are frequently striking color differences between specimens collected from a warm lake and specimens of the same species from a nearby cooler lake. In the subgenus *Tendipes*, many synonyms

have been made because authors were misled by the constant differences in color that they found between series of the same species collected in different seasons or from different bodies of water. The frequent differences in average size of individuals found between different populations of species of the subgenus *Tendipes* have made the color differences all the more misleading.

Many, and probably most, normally rather uniformly green species of Tendipedini develop dark markings when they breed in unusually cold water. Some species develop the dark markings more easily than others. These markings vary from an orange-tan through orange-brown to jet black. The more conspicuous ones are distributed in the more heavily sclerotized areas typically as follows: All of the pedicel; three broad longitudinal parallel stripes on the mesoscutum, of which the median stripe extends farther forward than the lateral ones but not so far backwards; most of the postnotum; most of the sterno-pleural sclerite; parts of other thoracic sclerites; and sometimes more or less of the abdominal tergites, especially on the discs and on the apical segments. The brown leg markings normally present are broadened and accentuated, though they are seldom more contrasting.

Sexual Differences

There is a marked sexual dimorphism. The female is heavier than the male, but because of a more compact build usually appears smaller. The sexes differ most strikingly in the following structural characters:

Character	Male	Female
General build.....	more slender	stouter
Scape.....	very large	moderately large
Flagellum.....	11 or 13 segments, with numerous long setae which make the flagellum appear plume-like	5 or 6 segments, with a few rather short setae
Front tarsus.....	in many species with a beard of long erect hairs	without a beard
Wing.....	narrower	broad
Abdomen.....	very long, straight, and somewhat depressed	not elongate, decurved, and somewhat compressed
Genitalia.....	conspicuous forceps	inconspicuous lobes

The color differences between the sexes are usually minor. In general it may be said that the female has the abdomen darker and less contrastingly marked than the male. Frequently the abdominal pattern of the male is entirely obscured. The female wing and leg markings are usually darker and more extensive, and the thoracic markings may be similar to those of the male, or darker, or lighter, according to the species.

Gynandromorphs are common, especially among those species of the subgenus *Tendipes* whose larvae live in the deeper parts of lakes. In some populations of *Tendipes plumosus* a fourth or more of the individuals are gynandromorphs. All gynandromorphs that I have seen are due to parasitism by a mermithid worm which can be found coiled in the abdomen of the gynandromorph. The mermithid larva is said usually to enter a mature female larva of

a tendipedid. When the parasitized female tendipedid larva becomes an adult, it has male genitalia, which are smaller than normal but otherwise typical. The antenna and form of the body are of the female type or intermediate between the female and male types. Gynandromorphs behave as females in that they copulate with males and have an "egg laying" flight out over the water.

Collection of Material

Adult specimens are easily collected from lighted windows and the lighted walls of buildings at night. The buildings should of course be near an aquatic habitat suitable for tendipedids. Adults will enter the windows of buildings which have been lighted and left open at night. The next morning, trapped specimens can be picked from the inside of the windows. Trap lights set in suitable locations will collect large quantities of specimens. A better but less convenient way of collecting is with an insect net, netting them from mating swarms at dusk or after flushing them or sweeping them lightly from their daytime resting places in the rank undergrowth of damp places.

Weed-choked coves of the larger rivers and bays of lakes are favored breeding places of Tendipedini. In the herbage and underbrush near such habitats, adults may occur by the millions. Smaller permanent ponds and streams are also well populated, to some degree with peculiar species, but their smaller area does not usually produce a high concentration of adults in the bordering vegetation. The best collecting season is spring and early summer. The majority of the species are most abundant then, though with a few exceptions they may be found on the wing throughout the growing season.

Tendipedids should not be collected with other insects. One should make a collecting trip for tendipedids alone, equipped with a light, fine-meshed insect net and several pocket-sized cyanide bottles. After a few hours of collecting, the specimens should be sorted and mounted, before they have had opportunity to dry partially or get broken by shaking about in the cyanide bottles. If immediate mounting is not possible, specimens may be stored between layers of glazed cotton or in small envelopes, but stored material does not make first-class mounted specimens. With a little effort, one can quickly accumulate good series of a surprising number of species, but if collecting tendipedids is made secondary to collecting other types of insects, a small number of mutilated specimens is the usual result.

Collectors should concentrate on the smaller species, especially on the small green ones. Most collections of tendipedids have been casually accumulated and have a top-heavy representation of the larger species. The color variation in these larger species often induces the assemblage of huge series of them in the belief that many species are represented. For the large number of smaller, superficially similar, greenish or blackish species the opposite mistake is usually made, with the result that these are scarce in collections.

Much remains to be learned about the early stages of tendipedids, though they can be easily reared. Most species breed in beds of aquatic weeds or in

the bottom ooze and debris of water up to 3 meters deep. A very few species habitually breed in deeper water. As a rule, the greenish species breed in weed beds and the darker colored species in the bottom mud. In collecting larvae and pupae, the bottom mud or masses of aquatic vegetation are taken (most conveniently with an Ekman dredge) and put in a fine-meshed net. The net full of mud or other material is washed in water to get rid of as much mud as possible and the residue then washed into a shallow white pan containing 2 or 3 centimeters of water. The specimens can be seen against the white pan bottom and those of interest gently removed with a wide-mouthed pipette. Ordinarily, only pupae and mature larvae should be saved for rearing. Mature larvae nearly ready to transform may be recognized by the subtriangular black rudiments of the imaginal eyes, which in the Tendipedinae are just back of the larval head on each side. Those that are nearest to transformation have the thoracic region swollen and with the wing and leg buds discernible through the larval skin. Pupae and mature larvae should be segregated in clean water, preferably from the original habitat, each in a small vial plugged with cotton. In a few days the adult will have emerged, and when hardened should be mounted on the same slide or preserved in the same vial of alcohol with its larval and pupal skins, to insure that they will not be disassociated. The larval skin is usually found attached to the abdomen of the pupa. This is true also of collected pupae, so collected pupae that have been reared usually give as much life history material as collected larvae. The larval head is more important than the rest of the larval skin. On a slide, it should be mounted ventral side up.

The importance of tendipedids in aquatic biology is turning attention to them. Investigators studying their ecology should have specific determinations, as the members of a genus usually have such diverse biologies that a generic determination is of relatively little significance. The present literature on immature stages can guarantee accurate determinations of very few species, so the ecological worker should not neglect to rear material of the species with which he is dealing. He should remember also that in many cases a reared female is not sufficient for a specific determination, but that a male specimen is needed.

The great size of the chromosomes in the salivary glands of the mature larvae of at least some species of Tendipedini has made them favorite objects of cyto-genetic research. In *Tendipes tentans* and related species, the nuclei found in these glands are large enough to be easily seen with the naked eye and under the microscope, their enlarged chromosomes show details of structure not ordinarily visible.

Preparation of Material

Adult Tendipedini are best preserved mounted on insect pins. The large species may be impaled, but the others should be glued to the side of a number one insect pin about 11 millimeters from the head, with a minute drop of white shellac. The insect should be stuck to the pin by the right side of the thorax or the extreme base of the abdomen. For best results, the shellac should

be almost as thin as it is sold commercially. A small bottle left open for a few days reaches the desired consistency. Other thin glues may be used if shellac is not available. Mounting on minuten nadeln is a superior method, but this type of mount is less convenient to handle and exposes the specimen to greater likelihood of breakage. Gluing to a point is a satisfactory method also, but for convenience in handling and protection of the specimen from breakage it is inferior to gluing directly to the pin. Preserving specimens in alcohol and preserving them on microscope slides are methods that can be used, and give a better view of the male genitalia than can be obtained from dried specimens, but the inconvenience of studying alcoholic material or of making slide mounts seems to offset the advantages of these systems.

Careful examination of the male genitalia requires that they be mounted on microscopic slides. To prepare a slide mount, the specimen is placed in a relaxing jar for several hours, then taken out and the terminal third of the abdomen clipped off with a pair of fine scissors. The specimen should have been relaxed enough that the tip does not jump and possibly get lost when it is clipped off. The clipped off part is put in a small dish or test tube of 10 percent potassium or sodium hydroxide kept steaming hot over an alcohol lamp or in a hot water bath. A safer but slower method is to use the caustic solution cold. After about 8 minutes in the hot caustic solution, or about 8 hours in the cold solution, the tissues of the specimen have been dissolved and the chitinous skeleton is transferred with a small pipette or on the point of a needle to a watch glass of water. Under a lower power dissecting binocular microscope, dissecting needles are used to maneuver undissolved debris out of the specimen and adjust the position of the genitalia. The specimen is then transferred to a watch glass of 95 percent ethyl alcohol, and after a few minutes in this solution to a microscope slide. On the slide it is turned exactly right side up, the excess alcohol drained off, and the specimen covered with rather thick euparal or diaphane and then with a cover glass. Both the slide and the remainder of the pinned specimen are given corresponding numbers so they can always be associated.

I have not found it necessary to stain tendipedine genitalia, though in the case of such small pale species as *Polypedilum convictum* staining would be helpful. Specimens may be mounted in balsam instead of in euparal or diaphane. If the mounting medium is to be balsam, the specimen should be dehydrated in cellosolve (sold by Carbide and Carbons Chemical Co., 30 East 42nd Street, New York, N. Y.) instead of in alcohol, or some other method of dehydration for balsam mounts may be used.

Nomenclatorial Problems

The generic name *Tendipes* Meigen, 1800 (genotype: *Tipula plumosa* Linnaeus) is used in the place of *Chironomus* Meigen, 1803 (genotype: *Tipula plumosa* Linnaeus) because it has priority over the latter name. The genus *Tendipes* has always gone under the name *Chironomus* in American and British literature, so the change is unfortunate, but to conserve the name *Chironomus* for the genus would require a suspension of the rules of nomenclature, and

since during the last 30 years a considerable portion of the world literature on the group has used the name *Tendipes*, it now seems impossible to get the overwhelming approval needed to justify a suspension of the rules. Many entomologists have tried to stop the adoption of the Meigen 1800 names, but it seems that the result of their efforts has been to prolong rather than to avert the unhappy period of transition.

Another unfortunate but necessary change in nomenclature is the application of the name *Tanytarsus* Wulp, 1874 to the group called *Phaenopsectra* (Kieffer 1921) by recent authors. The genotype of *Tanytarsus* is *Chironomus punctipes* Wiedemann, selected by Coquillett in 1910.⁴ Recent authors have preferred to use *Tanytarsus signatus* Wulp as the genotype on the grounds that, prior to Coquillett's selection, Kieffer⁵ defined *Tanytarsus* as lacking pulvilli, which character would exclude *punctipes* from the genus.⁶ Selection of genotypes by elimination is not a procedure that is sanctioned by recognized rules of nomenclature or by general use, so *Chironomus punctipes* must stand as the genotype of *Tanytarsus*. The group called *Tanytarsus* by recent authors should go under the name *Calopsectra* Kieffer, 1909, and the tribe Tanytarsini of authors is called Calosectrini in this paper.

The adoption of the generic name *Tendipes* in place of *Chironomus* necessitates finding another name for the family Chironomidae. Zoologists commonly use three different methods for forming or selecting the names of families and subfamilies: 1. The name is based on the oldest valid included generic name. 2. The name is based on the valid included generic name which was first used as the basis for the name of a supergeneric group. 3. After a family or subfamily name has been selected by the second method, but is found untenable because the type generic name on which it was based is not valid or not available, the substitute family name is based on the new name of the zoological genus which was type of the original family name. Each method has its followers and advantages. The uniform application of any would result in about the same amount of change in the family names that are now in common use.

In the present case, the use of the first or the third method would result in the selection of the family name Tendipedidae. Use of the second method would result in the selection of the name Eretmopteridae. The oldest available generic names included are *Tendipes* Meigen, 1800, and *Pelopia* Meigen, 1800; proposed on pages 17 and 18 respectively of the same paper. Between these two names revisers have consistently given *Tendipes* preference as a basis for the family name. Below are given the bibliographic data pertinent to the use of the other two methods.

CHIRONOMIDES Macquart, 1838. Type genus: (*Chironomus* Meigen, 1803) = *Tendipes* Meigen, 1800.

TANYPINA Skuse, 1889. Type genus: (*Tanytus* Meigen, 1803) = *Pelopia* Meigen, 1800.

⁴ Proc. U. S. Nat. Mus. 1910, 37:612.

⁵ Bull. Soc. d'Hist. Nat. Metz 1909, 26:49.

⁶ See Edwards, 1929, Trans. Ent. Soc. London 77:375.

ERETMOPTERIDAE Kellogg, 1900. Type genus: *Eretmoptera* Kellogg, 1900.

CLUNIONIDAE Kieffer, 1906. Type genus: *Clunio* Haliday, 1855.

TENDIPEDIDAE Grünberg, 1910. Type genus: *Tendipes* Meigen, 1800.

My present personal preference is to base family, superfamily, subfamily, and tribal names on that of the oldest available generic name included. Using this method, Tendipedidae is selected to replace Chironomidae.

Taxonomic Treatment

The following key to the subfamilies of Tendipedidae is modified from Edwards (1929, Trans. Ent. Soc. London 77:286).

KEY TO THE SUBFAMILIES OF TENDIPEDIDAE

1. Cross-vein m-cu present 2
 Cross-vein m-cu absent 4
2. Vein R_{2+3} absent 2. Podonomininae
 Vein R_{2+3} present 3
3. Vein R_{2+3} forked (i.e. connected with R_1 by a cross-vein).....
 1. Pelopiinae (=Tanypodinae)
 Vein R_{2+3} simple (i.e. not connected with R_1 by a cross-vein).....3. Diamesinae
4. Front basitarsus longer than the front tibia, or rarely slightly shorter; style of male genitalia directed rigidly backwards; middle and hind tibiae with the spurs modified into "combs".....6. Tendipedinae (=Chironominae), p. 12
 Front basitarsus shorter than the front tibia; style of male genitalia folded inwards; middle and hind tibiae with the tibial spurs not modified into "combs"..... 5
5. Pronotum not or narrowly divided in the center; anepisternal suture well developed; male flagellum usually plumose.....4. Hydrobaeninae (=Orthoclaadiinae)
 Pronotum broadly divided in the center; anepisternal suture obsolete; male flagellum not plumose.....5. Campontinae (=Clunioninae)

KEY TO THE TRIBES OF THE SUBFAMILY TENDIPEDINAE

1. Wing membrane without macrotrichia, or, if hairy, then the squama with a marginal fringe of long hairs; cross-vein r-m definitely oblique to the direction of vein R_{4+5} 1. Tendipedini, p. 12
- Wing membrane with macrotrichia, at least toward the apex and the squama without a fringe of hairs; cross-vein r-m nearly parallel to and practically continuous with vein R_{4+5}2. Calopsectrini (=Tanytarsini)

KEY TO THE NEARCTIC GENERA OF TENDIPEDINI

1. Flagellum of male with 11 segments (10 very short basal segments and 1 very long apical segment); middle tibia with two spines on the combs (one on each comb) except in *Glyptotendipes unacus* and in some species of *Harnischia* (*Cladopelma*); apex of front tibia on inner side with a low rounded scale which is not distinctly projecting (fig. 250)..... 2
- Flagellum of male with 13 segments (12 very short basal segments and 1 very long apical segment); middle tibia with a single spine on the combs, or, if two spines are present, then the apex of the front tibia with a distinctly projecting subtriangular spine or scale (figs. 245 to 249)..... 6
2. Pronotum, as seen from above, completely interrupted in the middle so that the two lateral halves are distinctly separated (figs. 237, 240, and 241)..... 3
- Pronotum not interrupted in the middle, though usually distinctly notched (figs. 238 and 239)..... 4

3. Median notch of pronotum narrow, not so broad as deep (fig. 237); superior appendage of male genitalia broad and with numerous bristles; anal point very broad *Xenochironomus*, p. 91
- Median notch of pronotum broadly V-shaped, broader than deep, and often about 0.3 as broad as the mesoscutum (figs. 240 and 241); superior appendage of male genitalia horn-shaped, with not more than one bristle beyond the base; anal point narrow *Glyptotendipes*, p. 144
4. Inferior appendage of male genitalia large, longer than the superior appendage and with many bristles; style and coxite not ankylosed; frons usually with a pair of tubercles at its center (fig. 260) *Tendipes*, p. 101
- Inferior appendage of male genitalia absent or very small, usually smaller than the superior appendage, with few or no bristles; style and coxite ankylosed; frons usually without tubercles 5
5. Inferior appendage of male genitalia with one or more apical bristles; frons often with a pair of tubercles near its center *Cryptochironomus*, p. 96
- Inferior appendage of male genitalia absent, or, when present, without bristles (though with numerous microtrichia); frons without tubercles *Harnischia*, p. 147
6. Pulvilli vestigial, not visible except in slide mounts (fig. 242) 7
- Pulvilli well developed, about 0.5 as long as the claws (figs. 243 and 244) 9
7. Fore tibia with an apical spine which with its broader base is about 1.2 as long as the tibial diameter (fig. 247); apical segment of male flagellum less than 0.5 as long as the combined length of the rest of the segments; squama without a fringe of hairs *Kribioxenus*, p. 34
- Fore tibia with an apical spine which with its broader base is not more than 0.6 as long as the tibial diameter (fig. 246), or without a spine; apical segment of male flagellum longer than 0.7 the combined length of the rest of the segments; squama often with a fringe of hairs 8
8. Fore tibia with an apical spine (fig. 246); middle tibia usually with two spines on the combs; squama often with a marginal fringe of hairs; male genitalia with a ventral pair of appendages *Paratendipes*, p. 27
- Fore tibia without an apical spine; middle tibia with a single spine on the combs; squama without a marginal fringe of hairs; male genitalia without a ventral pair of appendages *Apedilum*, p. 32
9. Squama without a marginal fringe of hairs *Lauterborniella*, p. 19
- Squama with a marginal fringe of long hairs 10
10. Both combs of middle and hind tibiae triangular in shape, widely separated at the base, and each with an apical spine (fig. 251); apex of front tibia with a black ventral triangular spur (fig. 245); pronotum wide and with a broad deep notch at its center (figs. 227 and 235) *Pseudochironomus*, p. 14
- Both combs of middle and hind tibiae neither triangular in shape nor widely separated (figs. 252 to 256); apex of front tibia without a spur, but usually with a spine or scale on the inner side (figs. 248 and 249) 11
11. Mesoscutum without a median longitudinal row of hairs; apex of fore tibia truncate, without a scale or spine; fore femur of male with a patch of backward-directed hairs at its apical 0.75 on the inner side *Microtendipes*, p. 22
- Mesoscutum with a double median longitudinal row of hairs; apex of fore tibia with a rounded or mucronate scale; fore femur of male without a patch of backward-directed hairs 12
12. Mesoscutum extending far forward beyond the pronotum (fig. 231); middle tibia with a spine on each comb *Stenochironomus*, p. 84
- Mesoscutum extending moderately or not at all beyond the pronotum (figs. 228, 229, and 230); middle tibia with a spine on the inner comb but none on the outer comb except in the subgenus *Endochironomus* of the genus *Tanytarsus* 13
13. Pronotum in the middle projecting forward from the most anterior point on the mesoscutum, slightly broader at the middle than at the side (fig. 228); hind tibia with a spine on the outer comb, the inner comb unarmed *Omisus*, p. 27

- Pronotum not or scarcely reaching as far forward as the most anterior point on the mesoscutum, distinctly narrower at the middle than at the side (figs. 229, 230, and 236) 14
14. Base of eighth tergite and sternite of male triangularly produced; male style with long bristles on the inner side; fore tibia of both sexes with a pointed scale ending in a conspicuous spine (fig. 248); outer comb of hind hibia with a spine, the inner comb unarmed (fig. 254); pulvilli deeply bifid (fig. 243, visible only at high magnifications) *Polypedilum*, p. 36
- Base of eighth tergite and sternite of male subtruncate; male style with short bristles on the inner side, some of which are microscopically forked near the apex; fore tibia of both sexes with a round-ended scale which has a minute apical spine or is unarmed (fig. 249); usually both combs of hind tibia with a spine; pulvilli entire *Tanytarsus*, p. 63

Genus PSEUDOCHIRONOMUS

Pseudochironomus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:500. Genotype: *Pseudochironomus richardsoni* Malloch (monobasic and original designation).

Prorithia Kieffer, 1921, Ann. Soc. Sci. Bruxelles 40, c. r.: 272. Genotype: (*Prorithia ploenensis* Kieffer) = *praspinatus* Staeger (monobasic and original designation).

Palpus with 4 segments; male flagellum with 13, female with 5 segments; frontal tubercles lacking; antennal ratio 1.7 to 3.0; eye with only a short dorsal extension, the two eyes separated above by more than twice the diameter of the male pedicel and much more widely separated above than below (in all other Nearctic genera, with a long dorsal extension above the base of the pedicel so that the two eyes are narrowly separated above, usually by less than the diameter of the male scape); pronotum interrupted medially by a broad v-shaped notch, otherwise uniformly broad, projecting about as far forward as the mesoscutum (figs. 227 and 235); squamal fringe present; wing membrane without macrotrichia; fork of Cu under or somewhat beyond r-m; ends of R_1 and R_{2+3} well separated; end of R_{4+5} far basad of the wing apex; end of M almost at the wing apex (fig. 259); leg ratio 0.8 to 1.1; tarsal beard present or absent; fore tibia with a conspicuous ventral black apical spur with a broadened base and slender point, about as long as the tibial diameter, apex of the tibia truncate (fig. 245); middle and hind tibiae each with a pair of subtriangular spurs with a broadened base and long tapering median spine, their bases well separated (fig. 251); pulvilli conspicuous lobes, entire.

Male genitalia: Anal point lacking; superior appendage broad and heavy; inferior appendage with a distal foot-shaped part and a mesal nipple-like sclerotized projection; a ventral pair of appendages present in the notch between the bases of the coxites on the ventral side, often more or less fused together. (The only other Nearctic genus with ventral appendages is *Paratendipes*.) See figs. 1 to 10.

KEY TO THE NEARCTIC SPECIES OF PSEUDOCHIRONOMUS

1. Hairs between the median and lateral lobes of mesoscutum arranged in an irregular row that is several hairs wide; thorax robust; mesoscutal stripes blackish 2
- Hairs between the median and lateral lobes of mesoscutum arranged in a regular single row; thorax less robust; mesoscutal stripes pale or blackish 3
2. Thorax green with broad mesoscutal and other markings black; abdomen greenish 1. *crassus*, new species
- Thorax and abdomen almost uniformly blackish 2. *richardsoni* Malloch

3. Thorax heavily marked with black.....7. *middlekauffi*, new species
Thorax not marked with black, sometimes marked with light brown..... 4
4. Distal outer margin of third palpal segment with a finger-like lobe; abdominal
tergites sometimes unicolorous, but each usually with a brown transverse band
from which arise brown hairs.....3. *fulviventris* (Johannsen)
Distal outer margin of third palpal segment simple; abdomen and its hairs uni-
formly pale, except sometimes in *P. banksi*..... 5
5. Fore tarsus of male distinctly bearded with long divergent hairs.....4. *pseudoviridis* (Malloch)
Fore tarsus of male without a distinct beard..... 6
6. Ventral appendages of male genitalia separated from each other nearly or quite
to the base (figs. 5 and 6) 7
Ventral appendages of male genitalia fused together nearly or quite to the apex
(figs. 8 to 10) 8
7. Ventral appendage subtriangular, about 2.5 as long as its greatest width; superior
appendage not unusually broad (fig. 5).....5. *anas*, new species
Ventral appendage lanceolate, about 6.0 as long as its greatest width; superior
appendage very broad (fig. 6).....6. *banksi*, new species
8. Superior appendage of male genitalia, as seen from above, narrow (fig. 8);
inner basal angle of inferior appendage acute.....8. *chen*, new species
Superior appendage of male genitalia, as seen from above, broader (figs. 9 and
10); inner basal angle of inferior appendage obtuse, or apparently obtuse..... 9
9. Superior appendage of male genitalia more slender apically and with a prominent
subapical outer angle (fig. 9).....9. *aix*, new species
Superior appendage of male genitalia stouter apically and without a prominent
subapical outer angle (fig. 10).....10. *nelia*, new species

1. *Pseudochironomus crassus*, new species

Male: Wing 3.1 mm. long; leg ratio 0.83; antennal ratio 2.15; thorax robust; hairs between the median and lateral lobes of the mesoscutum arranged in an irregular row that is several hairs wide; fore tarsus not bearded.

Dusky green. Pedicel of antenna, mesoscutal stripes, mesosternum, postnotum, and a small spot on plerum beneath the wing dark brown; mouthparts and flagellum beyond the first segment greenish brown.

Genitalia: Figure 1, drawn from the type. The broad style and large inferior appendage as well as the unusually large relative size of the genitalia are distinctive.

Female: Unknown.

Type: Male, Hudson Bay Territory (Harvard).

2. *PSEUDOCHIRONOMUS RICHARDSONI* Malloch

Pseudochironomus richardsoni Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:500: type locality: Havana, Ill. (Ill.); description of pupa and adult.

Pseudochironomus richardsoni Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:16; description of larva and pupa.

Male: Wing 3.0 mm. long; leg ratio 0.9; antennal ratio 2.2; thorax robust; hairs between median and lateral lobes of mesoscutum arranged in an irregular row that is several hairs wide; fore tarsus with a short indistinct beard.

Blackish brown, the thorax pruinose. Legs brown.

Genitalia: Figure 2. The ventral appendages are very small and well separated. The ninth tergite usually has a distinct apical notch.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and females from Colorado (Fort Collins); District of Columbia (Washington); Iowa (Crystal Lake at Davenport); Maryland (Forest Glen); Nevada (Reno); New Mexico (Mesilla); New York (Canajoharie and Hudson); and Utah (Brigham City). This is an uncommon species found in the adult stage throughout the summer.

3. PSEUDOCHIRONOMUS FULVIVENTRIS (Johannsen)

Chironomus fulviventris Johannsen, 1905, Bull. N. Y. State Mus. 86:229; type localities: Saranac Inn and Ithaca, N. Y. (Johannsen collection). Johannsen's figure of the male genitalia shows that his original series was mixed.

Tendipes fulviventris Bause, 1914, Arch. Hydrobiol. Suppl. 2: 116; generic position.

Chironomus fulviventris Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19: 410; biology.

Stictochironomus fulviventris Lenz, 1921, Deut. Ent. Ztschr., p. 161; generic position. *Pseudochironomus fulviventris* Johannsen, 1932, Jour. N. Y. Ent. Soc. 42:352; generic position.

Male: Wing 3.0 mm. long; leg ratio 1.02; antennal ratio 2.7; thorax narrow; hairs between median and lateral lobes of mesoscutum arranged in a single regular row; distal outer margin of third palpal segment with a finger-like projecting lobe (the only species of *Pseudochironomus* known to me with this character); fore tarsus without a beard.

Orange-yellow or sometimes pale green. Mouthparts, flagellum beyond the first segments, tarsi, and front tibia brownish. Abdominal tergites 2 to 8 each usually with a more or less distinct transverse brown band from which arise brown hairs instead of the usual pale ones.

Genitalia: Figure 3. Similar to those of *P. anas* (fig. 5) but with the ventral appendages well separated at the base.

Female: Somewhat deeper orange than the male, but otherwise similar except for the usual sexual differences.

Material: Many males and females from Iowa (Davenport); Kansas (Douglas County); Louisiana (Covington); Maryland (Plummers Island); Michigan (Iosco County and Mackinac County); Minnesota (Cass Lake and Crookston); New Jersey (Westville); New York (Buffalo, Canajoharie, Elmira, Hagaman, Ithaca, Oneonta, Otsego Lake, and Poughkeepsie); Ontario (Costello Lake in Algonquin Park, Fort Erie, Normandale, Ottawa, Point Pelee, and Ridgeway); Quebec (Coteau du Lac and Aylmer); Pennsylvania (Philadelphia); and Wisconsin (Madison). In central New York, adults are common throughout the summer.

4. PSEUDOCHIRONOMUS PSEUDOVIRIDIS (Malloch)

Chironomus pseudoviridis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:450; type locality: Urbana, Ill. (Ill.).

Pseudochironomus pseudoviridis Johannsen, 1932, Jour. N. Y. Ent. Soc. 42:352; generic position.

Male: Wing 2.7 mm. long; leg ratio 0.95; antennal ratio 2.9; thorax narrow; hairs between the median and lateral lobes of the mesoscutum arranged in a single regular row; fore tarsus with a distinct beard of long divergent hairs, the longer hairs about 4.0 as long as the tarsal diameter.

Green. Mouthparts brown; flagellum except towards the base pale brown; thorax and pedicel pale orange yellow.

Genitalia: Figure 4. The rather large, incompletely divided ventral appendages are distinctive. In the specimen from Lugert, Okla., the ventral appendages are divided fully halfway to the base.

Female: Unknown.

Material: Male, Fort Collins, Colo., July 23, 1935, Ralph Swain (Townes); male, Fort Collins, Colo., August 6, 1935, Ralph Swain (Colo.); male, Urbana, Ill., September 5, 1914 (USNM); male, Urbana, Ill., September 27, 1914 (Ill.); male, Urbana, Ill., October 5, 1914 (Ill.); male, Lawrence, Kans., September 10, 1936, L. J. Lipovsky (Kans.); male, Idabel, Okla., June 30, 1937, Standish and Kaiser (Okla.); male, Lugert, Okla., June 11, 1937, Standish and Kaiser (Townes).

5. *Pseudochironomus anas*, new species

Male: Wing 2.9 mm. long; leg ratio 1.0; antennal ratio 2.5; thorax narrow; hairs between the median and lateral lobes of the mesoscutum arranged in a single regular row; fore tarsus with a short indistinct beard.

Light green. Flagellum beyond the first segment, mouthparts, and tarsi except towards the base brown; pedicel, mesoscutal stripes, postnotum, mesosternum, and a spot on the mesopleurum below the wing pale orange brown.

Genitalia: Figure 5, drawn from the type. Similar to those of *P. fulviventris* (fig. 3) but with the ventral appendages fused at the base.

Female: Unknown.

Type: Male, head of Chautauqua Lake, N. Y., July 27, 1937, H. K. Townes and G. E. Burdick (Townes).

Paratypes: Seven males collected with the type (Townes); male, Farmingdale, N. Y., July 3, 1938, H. and M. Townes (Townes); male, Ithaca, N. Y. (Cornell).

6. *Pseudochironomus banksi*, new species

Male: Wing 3.0 mm. long; leg ratio 0.88; antennal ratio ?2.0 (only a single flagellum is on the type specimens and this is in a poor position for measurement.); thorax long; hairs between median and lateral lobes of mesoscutum arranged in a single regular row; fore tarsus with a short indistinct beard.

Light green. Flagellum beyond the first segment, mouthparts, and tarsi towards their apices brown; pedicel and most of the thorax orange; abdominal

tergites 2 to 8 often with a median, broad, light brown, transverse band, most conspicuous on the terminal tergites.

Genitalia: Figure 6, drawn from the type. The very broad superior appendage and the completely separated, narrowly lanceolate ventral appendages distinguish this species.

Type: Male, Holliston, Mass., August 5, N. Banks (Harvard).

Paratypes: Male, Holliston, Mass., August 7 (Townes); male, Westville, N. J., August 13, 1893, C. W. Johnson (Harvard). The paratype from Westville, N. J., has a narrower superior appendage than the type.

7. *Pseudochironomus middlekauffi*, new species

Male: Wing 2.2 mm. long; leg ratio 0.83; antennal ratio 1.8; thorax moderately robust; hairs between the median and lateral lobes of the mesoscutum arranged in a single regular row; fore tarsus with a short indistinct beard.

Whitish green. Clypeus, mouthparts, pedicel, mesoscutal stripes, mesosternum, a spot on pleurum beneath wing, scutellum, and postnotum blackish; abdominal terga dark fuscous green; flagellum dusky; wing veins colorless.

Genitalia: Figure 7, drawn from the type. The completely fused ventral appendages and rather short superior appendage are characteristic.

Female: Unknown.

Type: Male, Vanderbilt Swamp, near the outlet of Cayuga Lake, N. Y., collected in a swarm at 4:00 p. m. on a sunny afternoon, May 22, 1939, W. W. Middlekauff (Townes).

Paratypes: Six males collected with the type (Townes); male, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes).

8. *Pseudochironomus chen*, new species

Male: Wing 2.6 mm. long; leg ratio 0.96; antennal ratio 2.1; thorax narrow; hairs between the median and lateral lobes of the mesoscutum arranged in a single regular row; fore tarsus without a beard.

Pale green, the head and thorax orange. Flagellum, mouthparts, fore tarsus, and middle and hind tarsi except towards their bases brown.

Genitalia: Figure 8, drawn from the type. The very narrow superior appendage, together with the prominent inner basal angle on the inferior appendage, is distinctive.

Female: Unknown.

Type: Male, Plummers Island, Md., at light, June 8, 1914, Schwarz and Shannon (USNM).

Paratype: Male collected with the type (USNM).

9. *Pseudochironomus aix*, new species

Male: Wing 2.2 mm. long; leg ratio 0.93; antennal ratio 2.0; thorax narrow; hairs between the median and lateral lobes of the mesoscutum arranged in a single regular row; fore tarsus without a beard.

Light green. Palpus, flagellum except towards base, and legs towards their apices somewhat infusate; pedicel and most of thorax light orange.

Genitalia: Figure 9, drawn from the type. The shape of the superior appendage is distinctive.

Female: Unknown.

Type: Male, Manistee County, Mich., August 30, 1941, R. R. Dreisbach (USNM).

10. *Pseudochironomus netta*, new species

Male: Wing 3.1 mm. long; leg ratio 1.0; antennal ratio 2.5; thorax long; hairs between median and lateral lobes of mesoscutum arranged in a single regular row; fore tarsus with a short indistinct beard.

Pale greenish or orange yellow, the head and thorax marked with slightly deeper orange. Flagellum, mouthparts, and tarsi except towards their bases brown.

Genitalia: Figure 10. Ventral appendages separated only by a notch between their tips, narrower than in *P. pseudoviridis* (fig. 4), inferior appendage and its accessory lobe shorter than in *P. anas* (fig. 5). Genitalia very similar to those of *P. chen* (fig. 8) and *P. aix* (fig. 9), but different from both in the shape of the superior appendage and from *P. chen* in the shape of the inferior appendage.

Female: Unknown.

Type: Male, Otsego Lake, N. Y., July 18, 1935, H. K. Townes (Townes).

Paratypes: Male, Holliston, Mass., August 5, N. Banks (Harvard); male, Missaukee County, Mich., July 7, 1940, R. R. Dreisbach (Dreisbach); male, Manistee County, Mich., August 30, 1941, R. R. Dreisbach (USNM); male, Westville, N. J., August 13, 1893, C. W. Johnson (Harvard); male, Canadarago Lake, N. Y., August 30, 1935, H. K. Townes (Townes); 4 males, Otsego Lake, N. Y., June 19, 1935, June 25, 1935, and July 18, 1935, H. K. Townes (Townes, Rempel); male, Ridgeway, Ontario, June 7, 1916, M. C. VanDuzee (Calif. Acad.).

Genus LAUTERBORNIELLA

Lauterborniella Bause, 1914, Arch. Hydrobiol. Suppl. 2: 120. Genotype: *Tanytarsus* (*Calopsectra*) *agraylodes* Kieffer (designated by Kieffer, 1921, Ann. Soc. Ent. France 20:28).

Zavreliella Kieffer, 1920, Bull. Soc. Ent. France 1919:334. Genotype: (*Chironomus clavaticus* Kieffer)=*marmoratus* Wulp (monobasic and original designation).

Palpus with 4 segments; male flagellum with 13, female with 5 or 6 segments; antennal ratio 1.1 to 1.8; frontal tubercles lacking; pronotum very narrow towards its center and sometimes evanescent medially, considerably surpassed by the anterior end of the mesoscutum; squamal fringe lacking; wing membrane without macrotrichia; fork of Cu well beyond r-m; ends of R_1 and R_{2+3} slightly to well separated; positions of the ends of R_{4+5} and M variable; leg ratio 1.4 to 2.4; tarsal beard absent; fore tibia with an internal apical triangular pointed scale which is about 0.7 as long as the tibial diameter; combs of middle and hind tibiae close together but not fused, the inner comb of the middle tibia and one or both of the combs of the hind tibia with a spine; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present; superior appendage broadly irregularly horn-shaped, with a number of setae; inferior appendage linear, with numerous setae. See figures 11 to 13.

Our three species of *Lauterborniella* differ greatly in appearance and are probably not closely related. Those with the wings spotted and the front femur somewhat clubbed on the apical half (*varipennis* and *perpulcher*) would go in the subgenus *Zavriella* of European authors. I do not use this grouping because on other characters, *varipennis* seems more closely related to *agrayloides* than to *perpulcher*. The larvae and pupae of *agrayloides* and the European *marmorata* (closely related to *varipennis*) show that these two species are probably more nearly related than adult appearance would indicate. The immature stages of *varipennis* and of *perpulcher* are unknown.

KEY TO THE NEARCTIC SPECIES OF LAUTERBORNIELLA

- | | |
|--|------------------------------------|
| 1. Wings and legs beyond coxae entirely white..... | 11. <i>agrayloides</i> (Kieffer) |
| Wings and legs beyond coxae with extensive dark markings..... | 2 |
| 2. Wing marked with pale gray (fig. 202); middle and hind tibiae whitish with a brown apical annulus..... | 12. <i>varipennis</i> (Coquillett) |
| Wing marked with dark rich brown (fig. 203); middle and hind tibiae dark brown except on extreme basal part..... | 13. <i>perpulcher</i> (Mitchell) |

11. LAUTERBORNIELLA AGRAYLOIDES (Kieffer)

Tanytarsus (*Calopsectra*) *agrayloides* Kieffer, 1911, Bull. Soc. d'Hist. Nat. Metz. 27: 45, 51; type locality: Germany (location of type unknown).
Lauterborniella agrayloides Bause, 1914, Arch. Hydrobiol. Suppl. 2: 120; generic position.
Chironomus (*Lauterborniella*) *agrayloides* Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 51, 52, 53, 62, 63; biology.

Male: Wing 1.5 mm. long, leg ratio 1.45; antennal ratio 1.2; thorax of normal shape; R_1 ending 0.5 way to the tip of R_{4+5} beyond r-m; R_{2+3} ending 0.33 way to the tip of R_{4+5} beyond the tip of R_1 ; combs of middle and hind tibiae well separated, the outer one on the hind tibia and inner one on the middle tibia narrower than the other and with a strong spine, the other combs unarmed.

Blackish brown. Wing, halter, legs beyond coxae, style, and inferior appendage white; flagellum brownish white.

Genitalia: Figure 11.

Female: Similar to the male except for the usual sexual differences. Flagellum with five segments.

I have compared American material with a series in the United States National Museum from England, determined by Edwards.

Material: Many males and females from New York (Canadarago Lake, Hudson River at Hudson, Otsego Lake, and Westchester County) and Ontario (Costello Lake in Algonquin Park). In central New York, adults of this species have been collected from June 19 to August 31. They are apparently most abundant during the last third of August. The species is widespread in Europe.

12. LAUTERBORNIELLA VARIPENNIS (Coquillett)

Chironomus varipennis Coquillett, 1902, Proc. U. S. Nat. Mus. 25:94; type locality: Las Vegas Hot Springs, N. Mex. (USNM).

Chironomus varipennis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:427; description.

Chironomus varipennis Gerry, 1932, Psyche 39:70; description.

Chironomus (Lauterborniella) varipennis Beyer, 1941, Iowa non-biting midges (mimeographed), p. 4; biology.

Chironomus (Lauterborniella) varipennis (Zavrelia group) Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:21, 49, 62; biology.

Male: Wing 2.1 mm. long; leg ratio 2.3; antennal ratio 1.7; thorax of normal shape; R_1 ending 0.6 way to the tip of R_{4+5} beyond r-m; R_{2+3} ending 0.2 way to the tip of R_{4+5} beyond the tip of R_1 ; combs of middle and hind tibiae distinctly separated; inner comb of middle tibia narrower than the outer comb and with a strong spine, the outer comb unarmed; outer comb of hind tibia much narrower than the inner comb and projecting far beyond it; both combs of hind tibia with a strong spine, or the inner comb unarmed; abdominal segments 2 to 6 each with a median longitudinal raised ridge occupying about the basal half of the segment. Long hairs arise from the ridge and a group of short hairs from its base, giving the abdomen a tufted appearance.

Dark grayish brown, mottled with a strong pruinescence. Flagellum and palpus pale brown. Wing marked with gray as in figure 202, the veins pale; legs beyond trochanters whitish, marked with dark brown on the apical half of fore femur (except at apex), basal 0.35 of middle and hind femora, apices of tibiae and tarsal segments, and a broad band on front tibia extending from the basal 0.12 to the apical 0.25; abdomen mottled with pale along the sides, especially on the basal segments; style and inferior appendage white.

Genitalia: Figure 12.

Female: Similar to the male except for the usual sexual differences and that the dark markings are somewhat heavier and more extensive. Flagellum with five segments.

The European *L. marmorata* Wulp (or *flexilis* Linnaeus) is very similar to *L. varipennis*. It differs in lacking the dorsal abdominal ridges, having heavier wing markings, and in always lacking a spur on the inner comb of the hind

tibia. *L. marmorata* reproduces parthenogenetically, the male being very rare, while in *L. varipennis* the male is as common as the female.

Material: Many males and females from the District of Columbia (Washington); Florida (West Palm Beach); Illinois (Urbana); Iowa (Davenport); Louisiana (Covington); Maryland (Blackwater Refuge at Cambridge); Michigan (Nottawa); New Jersey (Riverton); New York (Bemus Point, Ithaca, and Milford Center); Oklahoma (Hinton); Ontario (Costello Lake in Algonquin Park); Quebec (Missiquoi Bay); and Virginia (Falls Church). Collection dates for adults are from June 5 at Riverton, N. J. to September 3 at Milford Center, N. Y. I found the species abundant at lights at Bemus Point, N. Y., around July 12.

13. LAUTERBORNIELLA PERPULCHER (Mitchell)

Chironomus perpulcher Mitchell, 1908, Jour. N. Y. Ent. Soc. 16:13: type locality: Plummers Island, Md. (USNM).

Chironomus perpulcher Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:429; description.

Chironomus (Lauterborniella) perpulcher (Zavreliella group) Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 201:20; generic position.

Male: Wing 2.7 mm. long; leg ratio 2.0; antennal ratio 1.7; mesoscutum and mesosternum exceptionally long, strongly narrowed in front; R_1 ending 0.5 way to the tip of R_{4+5} beyond r-m; R_{2+3} ending 0.45 way to the tip of R_{4+5} beyond the tip of R_1 ; combs of middle and hind tibiae adjacent but not fused; inner combs somewhat narrower than the outer combs and with a rather small spine, the outer combs unarmed; legs with long dense hair.

Head brown, the flagellum paler and the mouthparts darker brown; thorax shining reddish brown, the postnotum and some indefinite pleural markings darker brown; wing very iridescent, marked with rich dark marmorate brown as in figure 203; halter white; legs brownish yellow, marked with white on the basal 0.7 of fore tibia, apex of hind femur, and basal 0.3 of hind tibia, and marked with dark mahogany brown on apical 0.33 of front femur, apical 0.8 of middle and hind femora, all of tibiae not marked with white, apices of tarsal segments, all of fifth tarsal segments, and all of fourth tarsal segment of front leg; abdomen chocolate brown; genitalia white. This is the most exquisitely colored of all tendipedids known to me.

Genitalia: Figure 13.

Female: Similar to the male except for the usual sexual differences. Flagellum with six segments.

Material: Many males and females from Illinois (Monticello, Mt. Carmel, and Urbana); Indiana (La Fayette); Kentucky; Maine (Orono); Maryland (Herzog Island, Jackson's Island, and Plummers Island); Missouri (Atherton); New Jersey (Atsion); New York (Sport Island in Sacandaga River); Oklahoma (Pearson); Ontario (Burke Falls); and Virginia (Great Falls). Collection dates indicate that adults occur throughout the summer, but are perhaps most common in June.

Genus MICROTENDIPES

Microtendipes Kieffer, 1915, Broteria (ser. zool.) 13:70. Genotype: (*Tendipes abbreviatus* Kieffer)=*chloris* (Meigen) (original designation).

Palpus with 4 segments; male flagellum with 13, female with 5 segments; antennal ratio 1.5 to 3.0; frontal tubercles lacking; pronotum evanescent medially, considerably surpassed by the anterior end of the mesoscutum; median hair row of mesoscutum lacking (present in nearly all others genera); squamal fringe present; fork of Cu slightly beyond r-m; ends of R_1 and R_{2+3} adjacent, the veins R_1 and R_{2+3} almost anastomosed; leg ratio 1.1 to 1.3; tarsal beard lacking; fore femur of male with a patch of backward-directed hairs at its apical 0.75 on the inner side (not present in any other genus); fore tibia apically truncate, unarmed; combs of middle and hind tibiae fused, the middle pair with an inner spine and the hind pair with an outer spine; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present; superior appendages broadly horn-shaped, with a number of setae; inferior appendage linear, with numerous setae. See figures 14 to 16.

KEY TO THE NEARCTIC SPECIES OF MICROTENDIPES

1. Legs and thorax uniformly very pale stramineous.....14. *caelum*, new species
Legs marked with brown; thorax brown or black.....2
2. Apical 0.12 of fore femur brown, the rest whitish.....15. *caducus*, new name
Apical 0.3 or more of fore femur brown or the apical 0.12 brown and another more or less distinct brown annulus at the apical 0.3.....3
3. Abdomen entirely blackish brown; legs uniformly dark brown.....
.....16c. *pedellus* var. *stygius*, new variety
Abdomen with the basal five segments greenish; legs stramineous marked with brown.....4
4. Females; thorax brown.....16a. *pedellus* var. *pedellus* (De Geer)
Males; thorax brown or black.....5
5. Apical 0.3 of fore femur uniformly dark brown; thorax blackish.....
.....16a. *pedellus* var. *pedellus* (De Geer)
Apical 0.12 of fore femur brown and another more or less distinct brown annulus at the apical 0.3; thorax brown.....16b. *pedellus* var. *aberrans* (Johannsen)

14. *Microtendipes caelum*, new species

Male: Wing 2.7 mm. long; leg ratio 1.3; antennal ratio 1.7.

Very pale stramineous, the abdomen very pale green. Flagellum except the basal segments light brown.

Genitalia: Figure 14, drawn from the type. The shape of the superior appendage is distinctive.

Female: Unknown.

This species is apparently very similar to the British *Chironomus rydalen-sis* Edwards, 1929, which differs in having a wing length of 3.3 mm. and the superior appendage of the male genitalia less definitely truncate and with a weaker outer apical angle.

Type: Male, South Hadley, Mass., May 14, 1936, M. C. Townes (Townes). This specimen was collected probably in "Miss Woolley's Gorge" on Mt. Holyoke campus.

15. *Microtendipes caducus*, new name for *CHIRONOMUS*

PALLIDUS Johannsen

Chironomus pallidus Johannsen, 1905, Bull. N. Y. State Mus. 86:230; type locality: Ithaca, N. Y. (Johannsen collection). Name preoccupied by Fabricius, 1805.

Chironomus pallidus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 454; description.

Male: Wing 3.2 mm. long; leg ratio 1.2; antennal ratio 2.2.

Head and thorax light brown, between the sclerites pale pruinose brown; abdomen pale green, the terminal segments sometimes darkened. Flagellum beyond the first segment and mouthparts brown; legs whitish, brown on about the apical 0.1 of femora, apical 0.1 of fore tibia, and basal 0.3 of fore tibia.

Genitalia: Figure 15. The narrow style, narrow and short anal point, and narrow and straighter superior appendage distinguish this species from *M. pedellus* (fig. 16).

Female: Similar to the male except for the usual sexual differences and that the thorax is paler brown.

Material: Many males and females from California (Tahoe City); Georgia (Burton); Illinois (Mokena); Maryland (Cabin John and Plummers Island); Michigan (East Lansing, Grand Rapids, Lake County, Midland County, and Osceola County); Minnesota (Olmsted County); New York (Brainerd, Connecticut Hill, Dolgeville, Hancock, Hoosick, Ithaca, Lake Mohonk, Lancaster, McLean, Malden Bridge, Middleville, North Fairhaven, Oneonta, Shokan, Silver Creek, Stillwater, and Troy); Ontario (Bothwell, Ottawa, and Point Pelee); Pennsylvania (Philadelphia and Pottstown); Quebec (Ile de Montreal and Ottawa Golf Club); and Virginia (Veitch). In central New York, adults of this species have been collected from May 12 to September 6. They are apparently most abundant from May 20 to August 1, when they are frequently very common in woods along medium-sized streams.

16. *MICROTENDIPES PEDELLUS* (De Geer)

Male: Wing 3.7 mm. long; leg ratio 1.2; antennal ratio 2.8.

Brown or blackish brown, the five basal abdominal segments pale green or somewhat infuscate; mouthparts dark brown; flagellum brown; legs stramineous, the apical 0.1 of middle and hind femora and about the apical 0.3 of front femur brown, or the front femur brown on its apical 0.1 and with another more or less distinct brown annulus at its apical 0.3; front tibia with about its basal 0.35 and apical 0.1 brown; middle and hind tibiae often somewhat brownish at the base and apex. Occasional specimens are entirely blackish brown with the legs dark brown.

Genitalia: Figure 16.

Female: See under the color varieties for descriptions of the females.

This species is divisible in America into the three color varieties described below. While these seem to be easily distinguished, I can find no structural differences and no clear ecological separation between them. In Europe there are

one or two other color forms which, as in America, may be distinct species. The forms *aberrans* and *stygius* do not, to my knowledge, occur in Europe. The variety *stygius* is scarce. Most of my specimens of this were collected in early spring. The variety *aberrans* and typical *pedellus* are both very common. It seems probable that the latter breeds in lakes and large slow rivers while the former prefers smaller swifter streams, but the evidence for this suggestion is fragmentary. Females of these two varieties can not be distinguished.

Material: See under the varieties.

16a. MICROTENDIPES PEDELLUS var. PEDELLUS (De Geer)

Tipula pedella De Geer, 1776, Mém. p. Servir à l'Hist. d. Insectes 6:379; type locality: Sweden (? Stockholm museum).

Chironomus pedellus Johannsen, 1905, Bull. N. Y. State Mus. 86:218; description.

Chironomus pedellus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:436; description.

Microtendipes pedellus Kieffer, 1918, Ent. Mitt. 7:50; key, generic placement.

Chironomus (Microtendipes) pedellus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:27; description of larva and pupa.

Chironomus aberrans Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 1938, 27, suppl.: 165, 171; biology; misdetermination of *aberrans* Johannsen.

Male: Basal five abdominal segments clear pale green or somewhat infuscate; thorax blackish brown; leg markings dark brown; entire apical third of fore femur dark brown.

Female: Marked essentially as the male, but the dark markings brown rather than blackish brown and the pale colors more brownish so that there is less contrast in the markings.

Specimens from England in the United States National Museum and the Johannsen collection, determined by Edwards and others, can not be distinguished from Nearctic specimens of this variety.

Material: Many males from Alberta (Edmonton); British Columbia (Duncan's); Idaho (Sweetwater); Maine (Bar Harbor and Mt. Desert); Massachusetts (Holliston, Wilmington, and Woods Hole); Michigan (Ann Arbor, Carp Lake in Emmet County, Detroit, East Lansing, Midland County, and Shelby); Minnesota (Olmsted County and St. Paul); New Jersey (Clementon and Moorestown); New York (Bemus Point, Cayuga Lake, Hudson, Ithaca, Kingston, McLean, Milford Center, Millwood, Otsego Lake, and Syracuse); Ohio (Summit County); Ontario (Costello Lake in Algonquin Park, Grand Bend, Hog's Back, Ottawa, and Timagami); Oregon (Independence); Quebec (Aylmer and Ottawa Golf Club); Rhode Island (Westerly); and Saskatchewan (Oxbow). In central New York, adults have been collected from April 17 to August 31. They are most abundant during May and June. This form is widespread and common in Europe.

I have also seen many female specimens. Localities represented by females in addition to localities listed above and under the variety *aberrans* are: Kansas (Little Gobi near Manhattan); Massachusetts (South Hadley); Michigan (Agricultural College, Alto, Arenac County, Gratiot County, and 13 miles north of Lapeer); New York (Johnstown and Pocantico Hills); and Oklahoma (Sherwood).

16b. *MICROTENDIPES PEDELLUS* var. *ABERRANS* (Johannsen)

Chironomus aberrans Johannsen, 1905, Bull. N. Y. State Mus. 86:221; type localities: Ithaca, N. Y.; Pennsylvania; Washington; and New Jersey (Johannsen collection).

Chironomus fascipes Coquillett, 1908, Proc. Ent. Soc. Wash. 9:145; type locality: Riverton, N. J. (USNM). New synonymy.

Chironomus aberrans Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:455; description.

Chironomus aberrans Moore, 1915, Bull. U. S. Bur. Fisheries 33:282; biology.

Chironomus deflexa Walley, 1926, Canad. Ent. 58:206; type locality: Ottawa, Ontario (CNC). New synonymy.

Chironomus (Microtendipes) aberrans Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:26; description of larva and pupa.

Chironomus (Microtendipes) aberrans Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 4; biology.

Male: Basal five abdominal segments clear pale green or rarely slightly infusate; thorax brown; leg markings brown. The apical 0.12 of the front femur is brown, basad of which is a paler annulus followed by a brown annulus at the region of the backward-turned hairs. Sometimes, in small pale specimens, these femoral bands are quite clean-cut.

Female: Indistinguishable from the female of typical *pedellus*, but averaging paler in color. All females not belonging to the variety *stygius* have been assigned to typical *pedellus*.

Material: Many males from Maryland (Cabin John, Forest Glen, and Plummers Island); Massachusetts; Michigan (Gladwin County, Newaygo County, and Notatawa); New Jersey (Riverton and Delaware Water Gap); New York (Brainerd, Buffalo, Ithaca, Lexington, Malden Bridge, North Blenheim, North Fairhaven, Stillwater, Stratford, and Tuxedo); North Carolina (Cedar Mountain); Ontario (NORMANDALE, Ottawa, and Smoky Falls in the Mattagami River); Pennsylvania (Montgomery County and Philadelphia); Quebec (Aylmer, Cascades Point, Hull, and Ottawa Golf Club); South Carolina (Greenville); and Virginia (Falls Church and Glencarlyn). In central New York, adults have been collected from April 30 to September 6. They are most abundant in late May and early June.

16c. *Microtendipes pedellus* var. *stygius*, new variety

Male: Entirely blackish brown, the legs uniformly brown.

Female: Colored like the male.

Type: Male, Cayuta Lake, N. Y., May 8, 1935, H. K. Townes (Townes).

Paratypes: Male, two females collected with the type (two females, Townes; male, Rempel); male, Grand Lake, Colo., May 31, 1923, H. G. Dyar (USNM); male, De Funiak Springs, Fla., March 1 (Harvard); male, Cass Lake, Minn., May 14, 1936, R. H. Daggy (Minn.); male, Berlin, N. H., May 3, 1941, H. K. Townes (Townes); two males, Costello Lake in Algonquin Park, Ontario, July 13, 1938, R. B. Miller (Miller). This appears to be a variety produced by cold, occurring usually in early spring.

Omisus, new genus

Genotype: *Omisus pica*, new species.

Palpus with 4 segments; male flagellum with 13, female with 6 segments; antennal ratio about 2.0; frontal tubercles lacking; pronotum of almost uniform width, slightly wider at the center and projecting forward from the most anterior part of the mesoscutum (fig. 228); squamal fringe present; wing membrane without macrotrichia; fork of Cu somewhat beyond r-m; ends of R_1 and R_{2+3} slightly but distinctly separated; ends of R_{4+5} and M equidistant from the wing apex; leg ratio about 1.6; tarsal beard lacking; fore tibia with a broad subtriangular inner apical scale ending in a long slender point, the two together about 0.8 as long as the tibial diameter; inner comb of middle tibia and outer comb of hind tibia with a long spine, the combs distinctly separated; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present: superior appendage of peculiar shape (fig. 17); inferior appendage long oval, with numerous setae. See figure 17.

Chironomus (*Microtendipes*) *caledonicus* Edwards, 1932, from Scotland, seems to be a member of this genus, though Edwards' description is inadequate for more than a tentative generic placement.

17. *Omisus pica*, new species

Male: Wing 3.2 mm. long; leg ratio 1.6; antennal ratio 2.05.

Shiny blackish brown. Flagellum, apices of coxae, trochanters, bases of femora, and base of halter yellowish brown; tarsi whitish; halter knob and wing veins brown.

Genitalia: Figure 17.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Center Harbor, N. H., H. G. Dyar (USNM).

Paratypes: Three males, Stratford, Conn., June 14, 1933, C. P. Alexander (Mass., Townes); 2 males, 2 females, Cataldo, Idaho, H. and M. Townes, July 1, 1940 (Townes); male, Holliston, Mass., June 16, N. Banks (Townes); male, Holliston, Mass., August 12, N. Banks (Harvard); male, Center Harbor, N. H., July 9, H. G. Dyar (Townes); female, Pinkham Notch, N. H., June 25, 1938, H. and M. Townes (Townes). The specimens that were collected by my wife and me were taken from marshy woods with a heavy undergrowth of ferns and sedges.

Genus PARATENDIPES

Paratendipes Kieffer, 1911, Bull. Soc. d'Hist. Nat. Metz 28:41. Genotype: *Chironomus albimanus* Meigen (monobasic and original designation).

Synparatendipes Bause, 1914, Arch. Hydrobiol. Suppl. 2:120. Genotype: *Chironomus albimanus* Meigen (by present designation). New synonymy.

Palpus with 4 segments; male flagellum with 13, female with 5 or 6 segments; antennal ratio 1.1 to 2.0; frontal tubercles absent; pronotum narrowed towards the middle and interrupted by a median notch, slightly wider at the center than just laterad of the center, even with or projecting slightly beyond the anterior end of the mesoscutum; squamal fringe present or absent; wing membrane without macrotrichia; fork of Cu somewhat beyond r-m; ends of R_1 and R_{2+3} slightly but distinctly separated; end of M somewhat nearer the wing apex than is the end of R_{4+5} ; leg ratio 0.95 to 1.9; tarsal beard lacking; fore tibia with an apical internal spine with a triangular base, the spine and its base about 0.6 as long as the tibial diameter (fig. 246); combs of middle and hind tibiae fused, each pair with one or two spines (fig. 252), or the middle pair rarely without spines; pulvilli vestigial (fig. 242).

Male genitalia: Anal point absent; superior appendage lanceolate with a blunt upturned apex; inferior appendage long oval with numerous setae; a ventral appendage, arising from near the base of the inferior appendage, is present. (The only other Nearctic genus with ventral appendages is *Pseudochironomus*.) See figures 18 to 23.

The Nearctic species of *Paratendipes* fall into two groups: The *albimanus* group comprising *albimanus*, *nitidulus*, *duplicatus*, and *basidens*; and the *subaequalis* group including *subaequalis* and *thermophilus*. The characters distinguishing these species groups are used in the first couplet of the key to species.

Besides those described below, there are two specimens in the United States National Museum which probably represent new species. One from Algonquin, Ill., is near *P. thermophilus* but has uniformly pale wings and a leg ratio of 1.2. The other is a teneral specimen from Truckee, Calif., similar to *P. basidens* but lacking the strong internal basal bulge on the style of the male genitalia.

KEY TO THE NEARCTIC SPECIES OF PARATENDIPES

1. Squama with a fringe of hairs (reduced to a few short hairs in *P. nitidulus*); anal point of male genitalia slightly widened near the apex and usually extending beyond the end of the inferior appendage; ninth tergite of male without hairs above; female flagellum with 6 segments (as far as known)..... 2
- Squama without a fringe of hairs; anal point of male genitalia tapering evenly to the apex and not extending to the end of the inferior appendage; ninth tergite of male with a few hairs above; female flagellum with 5 segments (as far as known). (Species without hairs on the squama are included also in the key to the species of *Apedilum*)...... 5
2. Thorax shining jet black, not pruinose; middle and hind tibiae yellowish, contrasting in color with the blackish femora..... 3
- Thorax blackish brown and strongly pruinose; middle and hind tibiae concolorous with the femora, or nearly so..... 4
3. Front basitarsus white, the apex brown; wing about 2.2 mm. long..... 18. *albimanus* (Meigen)
- Front basitarsus entirely black; wing about 1.65 mm. long..... 19. *nitidulus* (Coquillett)
4. Femora blackish brown..... 20. *duplicatus* (Johannsen)
- Femora stramineous..... 21. *basidens*, new species
5. Femora blackish brown; thorax jet black..... 22. *subaequalis* (Malloch)
- Femora light brown; thorax dark brown..... 23. *thermophilus*, new species

18. *PARATENDIPES ALBIMANUS* (Meigen)

- Chironomus annularis* Meigen, 1804, Klass. Besch. zweifl. Ins., p. 17; type locality: ?France (?Paris museum). This reference not seen.
- Chironomus albimanus* Meigen, 1818, Syst. Besch. Europ. zweifl. Ins. 1:40. New name for *Chironomus annularis* Meigen, 1804, not (De Geer) Meigen 1804 (as *C. annulatus*). The necessity for continuing this change in name is problematic.
- Chironomus albimanus* Johannsen, 1905, Bull. N. Y. State Mus. 86:214; description.
- Paratendipes albimanus* Kieffer, 1911, Bull. Soc. d'Hist. Nat. Metz 27:41; description, generic position.
- Chironomus* (*Paratendipes*) *albimanus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:27; description of larva and pupa.
- Chironomus albimanus* Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 165, 171; biology.

Male: Wing 2.2 mm. long; leg ratio 1.3; antennal ratio 1.6; squama fringed; anal angle of wing strong; tip of vein M slightly or not at all nearer the wing apex than is the tip of R_{4+5} .

Shining black, the basal abdominal segments brownish. Flagellum and palpus brown; halter knob white; wing veins brown; legs blackish brown except as follows: Fore basitarsus white except at the apex; basal 0.35 of femora, middle and hind tibiae and tarsi, and segments 2 to 5 of fore tarsus stramineous with the apices of the tibiae and the apical tarsal segments brown; style brown.

Genitalia: Figure 18. The superior appendage is of a slightly different shape from those of *P. nitidulus* (fig. 19) and of *P. duplicatus* (fig. 20).

Female: Similar to the male except for the usual sexual differences; flagellum with 6 segments.

A number of European specimens that I have studied seem indistinguishable from American specimens.

Material: Many males and females from California (Clio in Plumas County and Lake Tahoe); District of Columbia (Washington); Idaho (Coeur d'Alene Lake); Michigan (Ann Arbor, Detroit, Mason County, and Midland County); Minnesota (Olmsted County); Montana (Big Timber); New York (Bemus Point, Canadarago Lake, Cornwall, Gloversville, Hoosick, Hudson, Hyde Park, Ithaca, Jamesville, McLean, Malden Bridge, Mecklenburg, Milford Center, Oneonta, Otsego Lake, Poughkeepsie, Rome, Tuxedo, and between Ellis and Slaterville); North Carolina (Raleigh); and Virginia (Mountain Lake). In central New York, adults have been collected from May 20 to September 7. There appear to be several generations each season. This species is widespread in Europe.

19. *Paratendipes nitidulus* (Coquillett), new combination

- Chironomus nitidulus* Coquillett, 1901, Proc. U. S. Nat. Mus. 23:608; type locality: Riverton, N. J. (USNM).
- Chironomus nitidellus* Johannsen, 1905, Bull. N. Y. State Mus. 86: 210; misspelling of *nitidulus* Coquillett.
- Chironomus nitidellus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 468; description; misspelling of *nitidulus* Coquillett.

Male: Wing 1.65 mm. long; leg ratio 1.4; antennal ratio 1.2; squama with

a rather short fringe of a few hairs; anal angle of forewing moderate; tip of vein M slightly or not at all nearer wing apex than is the tip of R_{4+5} .

Shining black, the basal abdominal segments brown or sometimes the basal two segments yellowish; flagellum and palpus brown; halter knob white; wing veins brown; legs blackish brown except as follows: basal 0.3 of femora, middle and hind tibiae, and tarsi stramineous with the apices of the tibiae and the apical tarsal segments brown; style brownish white.

Genitalia: Figure 19. The superior appendage is of a slightly different shape from those of *P. albimanus* (fig. 18) and of *P. duplicatus* (fig. 20).

Female: Abdomen entirely blackish; flagellum with 6 segments. Otherwise similar to the male except for the usual sexual differences.

Material: Male, Plummers Island, Md., August 22, 1914, R. C. Shannon (USNM); male, 3 females, Riverside, N. J., June 18, 1939, H. K. Townes (Townes); 11 males, 1 female, Riverton, N. J., June 5, 1939, H. K. Townes (Townes).

20. *PARATENDIPES DUPLICATUS* (Johannsen)

Chironomus basalis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:441; type locality: Dubois, Ill. (Ill.). Name preoccupied by Staeger, 1845.

Chironomus (Paratendipes) duplicatus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:28; type locality: Beebe Lake, Ithaca, N. Y. (Johannsen collection); description of larva and pupa. New synonymy.

Male: Wing 2.7 mm. long; leg ratio 1.1; antennal ratio 1.95; squama fringed; anal angle of wing strong; tip of vein M slightly or not at all nearer the wing apex than is the tip of vein R_{4+5} .

Blackish brown, definitely pruinose. Flagellum, palpus, tibiae, and tarsi slightly paler than the body; halter knob yellowish white; wing veins brown.

Genitalia: Figure 20. The superior appendage is of a slightly different shape than those of *P. albimanus* (fig. 18) and of *P. nitidulus* (fig. 19).

Female: Similar to the male except for the usual sexual differences; flagellum with 6 segments.

Material: Many males and females from Illinois (Dubois); Massachusetts (South Hadley); Michigan (Ann Arbor, East Lansing, Midland County, and North Branch); Missouri (2 miles west of St. Louis); New York (Ithaca, Hamburg, and Syracuse); Pennsylvania (Harrisburg); and Rhode Island (Kingston). In central New York, adults have been collected from May 8 to June 24. Elsewhere they have been taken from April 24 at Dubois, Ill., to May 28 at East Lansing, Mich. This species is abundant in May but scarce in June and is not to be taken after then.

21. *Paratendipes basidens*, new species

Male: Wing 2.0 mm. long; leg ratio 1.5; antennal ratio 1.7; squama fringed; anal angle of wing strong; tip of vein M at the wing apex; tip of vein R_{4+5} basad of the wing apex.

Blackish brown and strongly pruinose, especially on the thorax; flagellum

light brown; halter knob grayish white; wing veins brown; legs beyond coxae brownish stramineous, the apical three tarsal segments and the tips of femora, tibiae, and of first two tarsal segments brown.

Genitalia: Figure 21. Distinguished from other Nearctic species by the hump at the base of the style on the inner side.

Female: Unknown.

Type: Male, Riverton, N. J., June 5, 1939, H. K. Townes (Townes).

Paratypes: Three males collected with the type (Townes); 2 males, Davenport, Iowa, May 22, 1942, U. A. Hauber (Hauber).

In addition, I have studied a number of specimens which probably belong to this species, but which have a leg ratio of from 1.35 to 1.9 and most of which have definite pale spots on the wing. These also differ in having the superior appendage of the male genitalia much broader at the apex, and with the setae less strongly grouped near the base of the appendage than is shown in the figure. These specimens are from Arizona (Wellton), Colorado (Rocky Ford), Missouri (Atherton), Oklahoma (Gore), and South Dakota (Missouri River at Chamberlin). They are in the collections of Cornell, Johannsen, Townes, and Minnesota.

22. *Paratendipes subaequalis* (Malloch), new combination

Chironomus subaequalis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:440; type locality: Muncie, Ill. (Ill.).

Male: Wing 1.5 mm. long; leg ratio 1.15; antennal ratio 1.2; squama without a fringe of hairs; anal angle of wing weak; tip of vein M at the wing apex; tip of vein R_{4+5} basad of the wing apex.

Black, somewhat pruinose; flagellum and palpus brown; halter knob white; wing veins brown; legs blackish brown, the middle and hind tibiae and tarsi slightly paler brown.

Genitalia: Figure 22. Apical part of superior appendage broader than in *P. thermophilus* (fig. 23).

Female: Similar to the male except for the usual sexual differences.

Material: Male, Stony Creek, Muncie, Ill., May 24, 1914 (paratype, Townes); female, Medford Lakes, N. J., June 17, 1939, H. K. Townes (Townes); male, "Sport Island" (?in Sacandaga River, N. Y.), June 27, 1910 (Cornell); 2 males, 1 female, Point Pelee, Ontario, June 19 and 24, 1925, G. S. Walley (CNC, USNM).

23. *Paratendipes thermophilus*, new species

Male: Wing 2.0 mm. long; leg ratio 1.0; antennal ratio 1.3; squama without a fringe of hairs; anal angle of wing rather strong; tip of vein M at the wing apex; tip of R_{4+5} basad of wing apex; fused tibial combs of middle leg with none, or one, or perhaps sometimes two projecting spines; fused combs of hind legs with one or two projecting spines.

Blackish brown and strongly pruinose, especially on the thorax. Flagellum,

palpus, and legs beyond coxae light brown, the apical tarsal segments slightly darker; halter knob pale brown; wing with the veins brown and the membrane marked with indefinite pale-gray spots as in figure 204.

Genitalia: Figure 23. Apical part of superior appendage narrower than in *P. subaequalis* (fig. 22).

Female: Similar to the male except for the usual sexual differences; flagellum with 5 segments.

Type: Male, Castle Hot Springs, Ariz., H. S. Barber and E. A. Schwarz, bred from algae from Castle Hot Springs over which water of 115° F. flowed in a slow stream; larva collected December 28, 1913, adult emerged in Washington, D. C., March 19, 1914 (USNM).

Paratypes: Three males, 3 females, same data as the type (USNM, Townes); male, Hot Springs, Ariz., June 26, 1901, H. S. Barber (Townes). Mr. Barber informs me that the last specimen was collected at the same locality as the type.

Apedilum, new genus

Genotype: *Apedilum succinctum*, new species.

Palpus with 4 segments; male flagellum with 13, female with 5 segments; antennal ratio 0.85 to 1.35; frontal tubercles lacking; pronotum narrow medially, about even with the anterior end of the mesoscutum; squamal fringe lacking; wing membrane without macrotrichia; fork of Cu far beyond r-m; ends of R_1 and R_{2+3} slightly but distinctly separated; end of R_{4+5} well separated from the wing apex; end of M near the wing apex; leg ratio 1.1 to 1.4; tarsal beard lacking; fore tibia without an apical scale or spine; combs of middle and hind tibiae completely or almost fused, each pair with a single spine (fig. 253); pulvilli vestigial.

Male genitalia: Anal point present or absent; superior appendage narrow to broad and flat, with several setae; inferior appendage lobe-like, with a number of setae. See figures 24 to 26.

KEY TO THE NEARCTIC SPECIES OF *APEDILUM* AND TO THE NEARCTIC SPECIES OF *PARATENDIPES* WITHOUT HAIR ON THE SQUAMA 7

1. Legs blackish; thorax black, shining or slightly pruinose..... 2
 Legs pale brown or stramineous; thorax brown, or blackish and strongly pruinose.... 3
2. Halter knob white..... 22. *Paratendipes subaequalis* (Malloch)
 Halter knob black..... 26. *Apedilum nigrohalterale* (Malloch)
3. Abdomen uniformly dark; wing with indefinite faint spots as in figure 204;
 wing about 2.0 mm. long..... 23. *Paratendipes thermophilus*, new species
 Abdomen with broad paler transverse bands at the incisures; wing either uni-
 formly pale or with definite though faint spots as in figure 205..... 4
4. Wing with definite though faint spots (fig. 205); wing about 1.3 mm. long.....
 25. *Apedilum elachistus*, new species
 Wing without spots, uniformly pale; wing about 2.0 mm. long.....
 24. *Apedilum subcinctum*, new species

7 Species of *Paratendipes* without a fringe of hair on the squama are superficially difficult to separate from *Apedilum* and are therefore included in this key as well as in the key to *Paratendipes*.

24. *Apedilum subcinctum*, new species

Male: Wing 2.0 mm. long; leg ratio 1.3; antennal ratio 1.12.

Dark brown, pruinose, the apical 0.3 of abdominal tergites 2 to 6 pale grayish brown. Abdominal tergites 1, 7, and 8 with a narrower and less definite apical pale band; palpi and legs lighter brown, the tibiae, except at base and apex, and the tarsi pale brown; halter, wing membrane, and wing veins whitish.

Genitalia: Figure 24. Similar to those of *A. elachistus* (fig. 25) except for the slightly longer superior appendage and the presence of an anal point.

Female: Similar to the male except for the usual sexual differences and that the abdominal pale bands are narrower and less distinct.

Type: Male, Reno, Nev., October 8, 1915, H. G. Dyar (USNM).

Paratypes: Sixty-seven males, 13 females, collected by H. G. Dyar in 1915 and 1916, at Reno, Nev., on 35 different days ranging from July 4 to November 4 (USNM, Townes); 7 males, Virginia Creek, Mono County, Calif., June 21, 1916, H. G. Dyar (USNM, Townes); male, Williams, Ariz., June 15, H. S. Barber (Townes); male, Flagstaff, Ariz., August 4, H. S. Barber (Townes); male, Las Vegas Hot Springs, N. Mex., August 11, H. S. Barber (USNM).

25. *Apedilum elachistus*, new species

Male: Wing 1.3 mm. long; leg ratio 1.15; antennal ratio 1.33.

Dark brown. Abdomen mostly pale brown with a paler transverse band on the apical part of each tergite, the terminal segments darker; flagellum and palpus pale brown; legs, halter, and wing veins whitish; wing membrane whitish spotted with pale gray as in figure 205.

Genitalia: Figure 25. The anal point is lacking.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Galveston, Tex., April 6, 1905, W. D. Pierce (USNM).

Paratypes: Female, Theodore, Ala., June 12, 1917 (Cornell); female, 3 males, Biscayne Bay, Fla., A. T. Slosson (USNM, Amer. Mus.); 2 females, St. Simon Island, Ga., April 22 to May 2, 1911, J. C. Bradley (Cornell, Townes); male, Bay St. Louis, Miss., June 17, 1917 (Townes).

26. *Apedilum nigrohalterale* (Malloch), new combination

Chironomus nigrohalteralis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:440; type locality: Havana, Ill. (Ill.).

Chironomus (*Lauterborniella*) *brachylabis* Edwards, 1929, Trans. Ent. Soc. London 77:406; type locality: Cambridge, England (British Mus.). New synonymy.

Chironomus (*Lauterborniella*) *nigrohalteralis* Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:41, 63; biology.

Male: Wing 1.4 mm. long; leg ratio 1.28; antennal ratio 0.95.

Black or blackish brown, including the legs and halter. Front basitarsus obscurely whitish except towards the apex; wing veins brownish.

Genitalia: Figure 26. Unique among the American Tendipedini in the very short style.

Material: Male, Hayden, Colo., August 23, 1940, H. K. Townes (Townes); male, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes); male, along river, Havana, Ill., April 30, 1914 (USNM); male, Urbana, Ill., September 5, 1914 (Ill.); male, Chautauqua Park, Urbana, Ill., April 29, 1914 (Ill.); 2 males, 2 females, New Harmony, Ind., August 16, 1918, J. M. Aldrich (USNM); male, Davenport, Iowa, August 14, 1942, U. A. Hauber (Hauber); female, Midland County, Mich., August 17, 1942, R. R. Dreisbach (Dreisbach); male, Ithaca, N. Y., May 20, 1934, H. K. Townes (Townes); 2 males, Ithaca, N. Y., September 12, 1938, H. K. Townes (Townes); male, Algonquin Park, Ontario, June 30, 1937, R. B. Miller (Miller); 7 males, Costello Lake, Algonquin Park, Ontario, July 1, 1938, R. B. Miller (Townes).

Genus KRIBIOXENUS

Kribioxenus Kieffer, 1921, Ann. Soc. Ent. France 90: 29, 53. Genotype: *Kribioxenus pallidus* Kieffer (monobasic).

Palpus with 4 segments; male flagellum with 13, female with 6 segments; antennal ratio 0.15 to 0.4; frontal tubercles lacking; pronotum very narrow medially, somewhat surpassed by the anterior end of the mesoscutum; squamal fringe lacking; wing membrane without macrotrichia; fork of Cu far beyond r-m; ends of R_1 and R_{2+3} well separated; ends of R_{4+5} and M equidistant from the wing apex; leg ratio 1.2 to 1.4; tarsal beard lacking; fore tibia with an internal apical spine with a triangular base, the spine about 1.3 as long as the tibial diameter (fig. 247); combs of middle and hind tibiae fused or somewhat separated, the middle pair with one spine and the hind pair with two; pulvilli vestigial.

Male genitalia: Anterior margin of eighth tergite and sternite subtriangularly produced medially, not rounded or subtruncate as in all other genera except *Polypedilum*; anal point present; ninth tergite with one or two median dorsal horn-like processes; superior appendage divided into two or more parts; inferior appendages long and slender, with a distal curve and with a few apical setae. See figures 27 to 29.

KEY TO THE NEARCTIC SPECIES OF KRIBIOXENUS

1. Ninth tergite of male genitalia with a single median dorsal horn-like process arising from its base; anal point narrow (fig. 27)..... 27. *babiyi* (Rempel)
- Ninth tergite of male genitalia with two median dorsal horn-like processes, one arising from the base and the other from the middle of the tergite; anal point broad (Figs. 28, 29A, and 29B)..... 2
2. Basal horn-like process of ninth tergite with a median cleft and broader than long (fig. 28); wing about 2.4 mm. long..... 28. *mirabilis*, new species
- Basal horn-like process of ninth tergite not cleft, about 4.0 as long as broad (excluding the apical tuft of hairs, figs. 29A and 29B); wing about 1.2 mm. long..... 29. *bicornis*, new species

27. *Kribioxenus babei* (Rempel)

Chironomus (Kribioxenus) babei Rempel, 1937, Canad. Ent. **69**:274; type locality: Ithaca, N.Y. (CNC).

Chironomus (Kribioxenus) babei Miller, 1941, Univ. Toronto Studies (biol. ser.) **49**:49, 61, 62; biology.

Male: Wing 2.1 mm. long; leg ratio 1.3; antennal ratio 0.33.

Head and thorax yellowish brown with some light-green markings; an indefinite brownish mark across mesopleurum beneath wing; abdomen fuscous green to dark brown; flagellum light brown; legs brownish stramineous, the apex of fore femur and base and apex of fore tibia a slight darker brown; halter knob greenish white.

Genitalia: Figure 27. The shape of the superior appendage, anal point, and dorsal basal process of the ninth tergite are distinctive. The median tubercle of the ninth tergite is lacking.

Female: Similar to the male except for the usual sexual differences.

Material: Male, West Palm Beach, Fla., October 31, 1942, D. E. Hardy (USNM); male, Brevort, Mich., August 1, 1936, C. W. Sabrosky (Sabrosky); male, Midland County, Mich., June 9, 1939, R. R. Dreisbach (Dreisbach); male, Chatham Center, N. Y., August 31, 1934, H. K. Townes (Townes), 2 males, Hancock, N. Y., August 11, 1935, H. K. Townes (Townes); male, Ithaca, N. Y., July 16, 1901 (Cornell); male, Campfire Club Lake at Millwood, N. Y., June 18, 1936, H. K. Townes (Townes); male, Westchester County, N. Y., June 19, 1936, H. K. Townes (Townes); and a number of males and females from Costello Lake in Algonquin Park, Ontario, collected from June 20, 1937, to July 19, 1937, by R. B. Miller (Miller).

28. *Kribioxenus mirabilis*, new species

Male: Wing 2.4 mm. long; leg ratio 1.4; antennal ratio 0.18.

Colored like *K. babei*. The abdomen of the type is olive green.

Genitalia: Figure 28, drawn from the type. The basal dorsal process of the ninth tergite has a group of rather long stout bristles, each of which ends in a feathered tip. Only their attachment points are shown in the figure. This species and *K. bicornis* (figs. 29A and 29B) both have two dorsal processes on the ninth tergite but the shape of the processes in each is quite different.

Female: Unknown.

Type: Male, Green Lake, Fulton County, N. Y., August 9, 1934, H. K. Townes (Townes).

29. *Kribioxenus bicornis*, new species

Male: Wing 1.2 mm. long; leg ratio 1.24; antennal ratio 0.18.

Colored like *K. babei* except somewhat paler and with more extensive green markings on head and thorax; abdomen dark pea green.

Genitalia: Figure 29A (dorsal view, drawn from the type) and 29B (lateral view of ninth tergite). The tuft of peculiar hairs on the basal tergal process is omitted in figure 29A and shown in figure 29B.

Female: Unknown.

Type: Male, west bank of Saluda River 0.3 mile below bridge on highway between Greenville, S. C., and Easley, S. C. (S. C. route 13), June 20, 1940, H. K. Townes (Townes).

Paratypes: Two males taken with the type (Townes).

Genus POLYPEDILUM

Palpus with 4 segments; male flagellum with 13, female with 5 segments; antennal ratio 0.9 to 2.3; frontal tubercles lacking; pronotum narrow or very narrow medially, somewhat surpassed by the anterior end of the mesoscutum (fig. 229); squamal fringe present; fork of Cu slightly to distinctly beyond r-m; leg ratio 1.1 to 2.2; tarsal beard lacking; fore tibia with an inner apical triangular pointed scale which is about 0.6 as long as the tibial diameter (fig. 248); inner comb of middle tibia and outer comb of hind tibia with a spine, the other combs unarmed (fig. 254); combs adjacent or fused; pulvilli conspicuous, each deeply bifid (fig. 243, the bifid condition visible only in slide mounts at high magnifications).

Male genitalia: Anterior margin of eighth tergite and sternite triangularly produced in the center, not rounded or subtruncate as in all other genera except *Kribioxenus*; anal point present; inferior appendage linear, with numerous setae and generally with one unusually long ventral seta that is directed caudad; inner apical bristles of style unusually long. See figures 30 to 67.

KEY TO THE SUBGENERA OF POLYPEDILUM

1. Wing membrane densely hairy; genitalia as in the subgenus *Polypedilum*.....*Pentapedilum*, p. 61
2. Wing membrane bare, except for microtrichia.....2
2. R_1 and R_{2+3} adjacent at their tips (figs. 213 to 215, except in *nubeculosum* and in *trigonus*, which species are included also in the key to *Tripodura*); superior appendage of male genitalia with a sharp-pointed apex and with only one bristle beyond its base (several bristles in the European *cultellatum*); anal point of male genitalia usually narrow and spine-like, never with notches in its sides nor with a tooth on each side of its base (figs. 45 to 64).....*Polypedilum*, p. 46
- R_1 and R_{2+3} distinctly, though narrowly, separated at their tips (figs. 206 to 212); superior appendage of male genitalia broad, without a pointed apex, and with several bristles on the apical part (except in *acifer*, which, except for the anal point, has genitalia as in the subgenus *Polypedilum*); anal point of male genitalia usually broad, often with notches in its sides, and usually with a large tooth or shoulder on each side of its base (figs. 30 to 44).....*Tripodura*, p. 36

Tripodura, new subgenus

Genotype: *Polypedilum* (*Tripodura*) *simulans*, new species.

Wing membrane without macrotrichia; ends of R_1 and R_{2+3} slightly but distinctly separated; ends of R_{4+5} and M equidistant from wing apex.

Male genitalia: Superior appendage lobe-like, with a number of macrotrichia beyond its base, covered with microtrichia and without an apical point except in *P. (T.) acifer* (fig. 44); anal point usually broad and usually with lateral basal shoulders that may be produced as teeth or spines. See figures 30 to 44.

Except for *acifer*, which has atypical genitalia, the members of this subgenus do not divide into well-marked species groups. *P. parvum* and *P. pardus* are apparently closely related. *P. albinodus* and *isocerus* differ only in antennal ratio and may even be the same species. *P. halterale*, *simulans*, *digitifer*, and *griseopunctatum* form a closely related group of species. They are similar in color as well as in many genitalic characters. Most of the species of this subgenus are inhabitants of the warmer regions.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS TRIPODURA

1. Pronotum rather wide above, distinctly projecting from the mesothorax; wing about 3.0 mm. long, with more or less distinct pale-gray spots as in figure 213 45. *nubeculosum* (Meigen) (subgenus *Polypedilum*) 2
- Pronotum very narrow above, not distinctly projecting from the mesothorax..... 2
2. Wing with definite grayish spots (figs. 206 to 212)..... 3
- Wing unspotted, though often with faint ill-defined clouds in the bases cells Cu_1 and R_5 and along the wing-veins..... 9
3. Cell R_5 with a single dark spot near its base (figs. 206 and 212)..... 4
- Cell R_5 with two or three dark spots (figs. 207 to 211)..... 5
4. Spot in cell R_5 slightly separated from the base of the cell (fig. 206); halter knob white..... 30. *scalaenum* (Schrank)
- Spot in cell R_5 covering the base of the cell (fig. 212); halter knob blackish (Included also in couplet 17)..... 43. *griseopunctatum* (Malloch)
5. Apical part of cell R_5 without a dark spot (fig. 207); each femur with a brown apical annulus that is darker than any other part of the femur..... 31. *apicatum*, new species
- Apical part of cell R_5 with a dark spot (figs. 208 to 211); none of the femora with an apical dark annulus, or, when present, the femur as dark at the basal third as at the annulus..... 6
6. Wing 1.9 to 2.1 mm. long; femora dark brown, each with a stramineous sub-apical annulus; halter knob white..... 32. *pterospilus*, new species
- Wing 1.3 to 1.7 mm. long; femora usually without a distinct subapical annulus.... 7
7. Cell Cu_1 with a detached discal dark spot (fig. 211)..... 35. *labeculosum* (Mitchell)
- Cell Cu_1 without a detached discal dark spot (figs. 209 and 210)..... 8
8. Superior appendage of male genitalia about 4.5 as long as broad (fig. 33); cell Cu_1 without an apical dark spot (fig. 209)..... 33. *parvum*, new species
- Superior appendage of male genitalia about 2.0 as long as broad (fig. 34); cell Cu_1 with a small apical dark spot (fig. 210)..... 34. *pardus*, new species
9. Halter knob white..... 10
- Halter knob blackish 14

10. Superior appendage of male genitalia narrowly horn-shaped, with a single bristle arising from its outer side (figs. 44 and 46, as in subgenus *Polypedilum*)11
 Superior appendage of male genitalia broad and pad-like, with several bristles (figs. 37 to 43, typical of subgenus *Tripodura*); wing length 1.3 to 2.8 mm.....12
11. Abdominal segments 2 to 6 of the male with a large subtriangular whitish spot on each side; wing about 2.0 mm. long.....
46. *trigonus*, new species (subgenus *Polypedilum*)
 Abdominal segments 2 to 6 uniformly blackish brown; wing about 1.3 mm. long44. *acifer*, new species
12. Anal point narrow and simple (fig. 38); leg ratio about 1.9.....
38. *gomphus*, new species
 Anal point broad and sagittate (fig. 37); leg ratio about 1.6.....13
13. Antennal ratio about 1.5.....36. *albinothus*, new species
 Antennal ratio about 1.0.....37. *isocerus*, new species
14. Antennal ratio about 1.0; wing length about 1.3 mm.39. *floridense*, new species
 Antennal ratio 1.35 to 2.1; wing length 1.5 to 2.5.....15
15. Superior appendage of male genitalia broad in the apical half, usually 2.0 to 3.0 as long as the apical part is broad (figs. 40 and 41).....16
 Superior appendage of male genitalia narrow in the apical half, usually 3.0 to 5.0 as long as the apical half is broad (figs. 42 and 43).....17
16. Inferior appendage of male genitalia with 7 to 9 bristles (fig. 41); leg ratio about 2.141. *halterale* (Coquillett)
 Inferior appendage of male genitalia with 10 to 14 bristles (fig. 40); leg ratio about 1.6540. *simulans*, new species
17. Apical part of superior appendage straight, not turned inwards (fig. 42).....
42. *digitifer*, new species
 Apical part of superior appendage turned inwards (fig. 43) (Included also in couplet 4).....43. *griseopunctatum* (Malloch)

30. *Polypedilum* (*Tripodura*) *scalaenum* (Schränk), new combination

- Tipula scalaena* Schrank, 1803, Fauna Boica 3:73; type locality: Ingolstadt, Germany (location of type unknown).
- Chironomus scalaenus* Johannsen, 1905, Bull. N. Y. State Mus. 86: 201; description.
- Chironomus needhami* Johannsen, 1908, Bull. N. Y. State Mus. 124:278; type localities: New York, Indiana, Kansas, and Washington (Johannsen collection).
- Chironomus needhami* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 428; description.
- Polypedilum scalaenum* Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle 29: 73; description, generic position.
- Chironomus* (*Polypedilum*) *needhami* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:30; generic position.
- Chironomus needhami* Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 165, 171; biology.
- Chironomus* (*Polypedilum*) *scalaenus* Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:49, 62; biology.

Male: Wing 1.6 mm. long; leg ratio 1.7; antennal ratio 1.2.

Dark brown. Mouthparts, antenna except scape, legs except coxae, halter, and style yellowish white; basal part of abdomen usually with indefinite paler areas; apices of femora usually brown; wing spotted with dark gray as in figure 206, the veins pale.

Genitalia: Figure 30. The superior appendage is unusually large and broad.

Female: Abdomen without distinct pale basal marks. Otherwise similar to the male except for the usual sexual differences.

I have studied British specimens of this species determined by Edwards. These average a little larger than American specimens and have paler wing spots, but apparently do not represent a distinct species.

Material: Many males and females from Alabama (Flatwood in Wilcox County, Leroy, and Theodore); Colorado (Hayden); District of Columbia (Washington); Georgia (Clayton); Florida (Miami, Jacksonville, and West Palm Beach); Illinois (Havana, Momence, Monticello, Urbana, and White Heath); Indiana (New Harmony, Indianapolis, and La Fayette); Iowa (Davenport); Kansas (Manhattan and Lawrence); Louisiana (Tallulah); Maine; Maryland (Forest Glen and Plummers Island); Michigan (Detroit, Douglas Lake, Manistee County, Midland County, and Walnut Lake); New Hampshire (Franconia and Mt. Washington); New Jersey (Riverton); New Mexico (Las Vegas Hot Spring); New York (Bemus Point, Canadarago Lake, Canajoharie, Hoosick, Ithaca, Juanita Island in Lake George, Kensico Reservoir, Mayville, Muscoot Reservoir, North Fairhaven, and Poughkeepsie); Nevada (Reno); Ontario (Costello Lake in Algonquin Park); Pennsylvania (Philadelphia); South Carolina (Greenville); and Virginia (Falls Church). Adults are to be found throughout the growing season. At Ithaca, N. Y., they have been collected from May 5 to September 12. This species is widespread and common in Europe. It has also been taken in Palestine.

31. *Polypedilum (Tripodura) apicatum*, new species

Chironomus octopunctatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:427; description; misdetermination of *octopunctatus* Loew.

Male: Wing 1.6 mm. long; leg ratio 2.0; antennal ratio 1.15.

Dark brown. Legs pale brown with the coxae and an apical annulus on each femur brown; wing spotted with dark gray as in figure 207, the veins light brown; halter whitish.

Genitalia: Figure 31, drawn from the type.

Female: Unknown.

The four definite spots in the wing easily distinguish this species.

Type: Male, Las Vegas Hot Spring, N. Mex., August 7, H. S. Barber (USNM).

Paratypes: Five males, Las Vegas Hot Spring, N. Mex., August 4 and August 14, H. S. Barber (USNM).

The specimens recorded from Urbana, Ill. as *Chironomus octopunctatus* by Malloch seem to belong to this species.

32. *Polypedilum (Tripodura) pterospilus*, new species

Male: Wing 2.0 mm. long; leg ratio 1.65; antennal ratio 1.35.

Blackish brown. Femora brown with a narrow subapical stramineous annulus; tibiae with a faint subbasal brown annulus, the rest of the legs except the coxae brownish stramineous; halter whitish; wing spotted with dark gray as in figure 208, the veins pale brown; style and inferior appendage pale brown; apical 0.16 of abdominal tergites and mottling on thorax cinereous.

Genitalia: Figure 32, drawn from the type. The shape of the anal point and the lack of lateral points on the ninth tergite are unusual.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Devils River, Tex., May 5, 1907, Bishopp and Pratt (USNM).

Paratypes: Five males, 1 female, collected with the type (USNM, Townes); female, Nogales, Ariz., November 5, 1936 (USNM); 3 females, San José, Costa Rica, H. Schmidt (USNM).

33. *Polypedilum (Tripodura) parvum*, new species

Male: Wing 1.4 mm. long; leg ratio 2.1; antennal ratio 1.15.

Dark brown. Legs except coxae pale brown, the femora darker and with an indistinct subapical paler annulus; halter whitish, the knob often blackish; wings rather indistinctly spotted with gray as in figure 209, the veins pale brown; style and inferior appendage pale brown.

Genitalia: Figure 33. The long slender appendages, with relatively few bristles on each, plus the lack of lateral points on the ninth tergite are characteristic.

Female: Similar to the male except for the usual sexual differences.

Although the wing pattern is rather similar to that of *P. pardus* (fig. 210), the less definite spots and minor differences in pattern may be used to distinguish the two species.

Type: Male, Bay St. Louis, Miss., June 17, 1917 (Cornell).

Paratypes: Four females, Leroy, Ala., June 12, 1917 (Cornell); 6 males, 40 females, Theodore, Ala., June 12, 1917 (Cornell, Townes); 6 females, Sabine River Ferry opposite Orange, La., June 20, 1917 (Cornell); 4 males, 3 females, Cambridge, Md., July 21 to 29, 1932, July 23 to 29, 1932, September 24, 1932, and 1932 (USNM, Townes); 9 males, 1 female, Crisfield, Md., June 29, 1932, June 29 to July 5, 1932, July 15, 1932, July 19, 1932, and August 7, 1932 (USNM, Townes); 8 males, 10 females, collected with the type (Cornell, Townes); and female, Gillett in Karnes County, Tex., June 25, 1917 (Cornell).

34. *Polypedilum (Tripodura) pardus*, new species

Male: Wing 1.3 mm. long; leg ratio ? (fore tarsi lacking in types); antennal ratio 1.5.

Similar in color to *P. parvum* except that the wing spotting (fig. 210) is more definite and the pattern slightly different. Cell Cu_1 has a small spot in its apex. In the two specimens before me the apex of the halter knob is dark.

Genitalia: Figure 34, drawn from the type. Differ from those of *P. parvum* (fig. 33) in the distinctly shorter and broader anal point and appendages.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Brownsville, Tex., May 4, 1904, H. S. Barber (USNM).

Paratype: Female, collected with the type (USNM).

This may be *Chironomus spilopterus* Williston 1896, described from St. Vincent in the West Indies. I have seen a female specimen in the Cornell collection which may be a cotype. Although it is apparently a specimen of *P. pardus*, it does not agree well with Williston's figure of the wing pattern of *C. spilopterus*.

35. *Polypedilum (Tripodura) labeculosum* (Mitchell), new combination

Chironomus labeculosum Mitchell, 1908, Jour. N. Y. Ent. Soc. 16:14; type locality: Hot Springs, Ariz. (USNM).

Male: Unknown.

Female: Wing length 1.6 mm.; leg ratio 1.9.

Dark brown. Flagellum and mouthparts light brown; legs except coxae pale brown, the apex of each femur and tibia with a small indistinct brown annulus; wings marked with pale gray spots as in figure 211, the veins brownish; halter whitish.

This is the only Nearctic species of *Polypedilum* with a disconnected spot in cell Cu_1 .

Material: Three females (including the type), Hot Springs, Ariz., June 27, H. S. Barber (USNM).

36. *Polypedilum (Tripodura) albinodus*, new species

Male: Wing length 2.3 mm.; leg ratio 1.6; antennal ratio 1.5.

Similar to *P. isocerus* except in antennal ratio and that the wings are without conspicuous gray markings and the veins whitish. However, the paratype from Virginia has the wings marked as in *P. isocerus*.

Genitalia: Not different from those of *P. isocerus* (fig. 37).

Female: Unknown.

Type: Male, Sandpoint, Idaho, July 3, 1917, H. G. Dyar (USNM).

Paratype: Three males collected with the type (USNM, Townes); male, Mountain Lake, Va., July 18, 1938, L. J. and M. J. Milne (Townes).

37. *Polypedilum* (*Tripodura*) *isocerus*, new species

Male: Wing 2.3 mm. long; leg ratio 1.54; antennal ratio 0.9; apical part of flagellum broader than usual, subclavate.

Dark brown. Antenna beyond scape, palpus, wing veins, legs except coxae, style, and inferior appendage pale brown; halter knob white; wings streaked with pale gray along the veins, more broadly and conspicuously so in the bases of cells R_5 and Cu_1 and along veins Cu_2 and 2A.

Genitalia: Figure 37. Indistinguishable from those of *P. albinodus*. Similar to those of *P. halterale* (fig. 41) except that the superior appendage is slightly shorter and broader and the anal point slightly longer, narrower, and usually without lateral notches.

Female: Similar to the male except for the usual sexual differences.

This species is like *P. albinodus* except that it has a different antennal ratio and usually more gray on the wings.

Type: Male, Fallen Leaf, Lake Tahoe, Calif., June 18, 1916, H. G. Dyar (USNM).

Paratypes: Male, collected with the type (Townes); 2 males, Virginia Creek, Mono County, Calif., June 21, 1916, H. G. Dyar (USNM); male, Reno, Nev., August 6, 1915, H. G. Dyar (USNM); female, Reno, Nev., August 18, 1915, H. G. Dyar (USNM).

38. *Polypedilum* (*Tripodura*) *gomphus*, new species

Male: Wing length 1.3 mm. (paratype) to 2.0 mm. (type); leg ratio 1.8 (type) to 2.0 (paratype); antennal ratio 1.2 (paratype) to 1.5 (type).

Blackish brown. Legs except coxae, wing, and halter whitish.

Genitalia: Figure 38, drawn from the type. The simple anal point is distinctive.

Female: Unknown.

Type: Male, South Hadley, Mass., May 14, 1936, M. C. Townes (Townes).

Paratype: Male, Saluda River west of Greenville, S. C., June 20, 1940, H. K. Townes (Townes).

39. *Polypedilum (Tripodura) floridense*, new species

Male: Wing length 1.3 mm.; leg ratio 1.7; antennal ratio 1.0.

Dark brown. Antenna beyond scape, palpus, legs except coxae, wing veins, and halter except knob stramineous brown; halter knob blackish.

Genitalia: Figure 39. The peculiar broad anal point and the apically narrowed appendages are distinctive.

Type: Male, Bay St. Louis, Miss., June 17, 1917 (Cornell).

Paratypes: Thirteen males, 10 females, collected with the type (Cornell, Townes); male, Biscayne Bay, Fla., A. T. Slosson (USNM).

40. *Polypedilum (Tripodura) simulans*, new species

Chironomus (Polypedilum) halteralis Miller, 1941, Univ. Toronto Studies (biol. ser.) 41:29, 31, 44, 47, 48, 49, 50, 59, 61, 62; biology; misdetermination of *halteralis* Coquillett.

Male: Wing length 2.0 mm.; leg ratio 1.65; antennal ratio 1.8.

This species is very similar to *P. halterale* but is slightly larger, darker, and stouter, with a different leg ratio and genitalia.

Genitalia: Figure 40. Resemble those of *P. halterale* (fig. 41) except that the lateral points of the ninth tergite, style, and appendages are shorter and stouter, and that the inferior appendage has 10 to 14 instead of 7 to 9 bristles. The style averages 5.3 as long as broad and the superior appendage 1.8 as long as broad.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Ithaca, N. Y., June 6, 1935, H. K. Townes (Townes).

Paratypes: Male, Washington, D. C. (USNM); male, Washington, D. C., June 7, H. S. Barber (USNM); 2 males, Crystal Lake and Okoboji, Davenport, Iowa, April 30, 1941, and August 1, 1939, U. A. Hauber (Hauber); 2 males, Plummers Island, Md., June 8, 1914, Schwarz and Barber (USNM); male, Plummers Island, Md., August 3, 1913, R. C. Shannon (USNM); male, Holliston, Mass., July 29, N. Banks (Harvard); male, Manistee County, Mich., July 6, 1940, R. R. Dreisbach (Dreisbach); male, Big Timber, Mont., July 14, 1917, H. G. Dyar (Townes); male, Riverton, N. J., June 5, 1939, H. K. Townes (Townes); 3 males, Riverton, N. J., June 18, 1939, H. K. Townes (Townes); male, Canajoharie, N. Y., June 30, 1934, H. K. Townes (Townes); male, Canajoharie, N. Y., July 7, 1934, H. K. Townes (Townes); 2 males, Ithaca, N. Y., August (Cornell); male, Ithaca, N. Y., June 6, 1935, H. K. Townes (Townes); male, Ithaca, N. Y., September 12, 1935, H. K. Townes (Townes); male, Summit County, Ohio, August 18, 1938, L. J. Lipovsky (Townes); male, Muse, Okla., June 25, 1937, Standish and Kaiser (Okla.); male, Pearson, Okla., July 23, 1937, Standish

and Kaiser (Okla.); male, Sherwood, Okla., June 27, 1937, Standish and Kaiser (Townes); male, Costello Lake in Algonquin Park, Ontario, June 18, 1938, R. B. Miller (Townes); male, Orillia, Ontario, July 15, 1923, C. H. Curran (CNC); male, Sylvan Lake, Black Hills, S. Dak., June 27, 1940, H. K. Townes (Townes); and male, Falls Church, Va., June 12, N. Banks (Harvard). The above paratypes are the only specimens of which I have made genitalia slides. I have seen many other males and females from the same localities and from the following additional localities: Maine (Mt. Desert); Minnesota (Carver County, Cass Lake, Grand Marais, Hennepin County, Lesueur County, and St. Peter); and New York (Canadargo, Lake, Delta Lake, Green Lake in Fulton County, Kinderhook, McLean, Middleville, Milford Center, Niskayuna, Oneonta, Otsego Lake, and Rome). These latter specimens are in the collections of Rempel, Cornell, Townes, Minnesota, United States National Museum, Kansas, and Miller.

41. *Polypedilum (Tripodura) halterale* (Coquillett), new combination

Chironomus halteralis Howard, 1900, Proc. Wash. Acad. Sci. **2**: 559; biology; *nomen nudum*.

Chironomus halteralis Coquillett, 1901, Ent. News **12**: 17; type locality; Washington, D. C. (types lost).

Chironomus halteralis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**: 467; description.

Chironomus halteralis McAtee, 1915, Science **42**: 695; biology.

Chironomus (Polypedilum) halteralis Miller, 1941, Univ. Toronto Studies (biol. ser.) **41**: 20; generic position. (Miller's observations were based on *P. simulans*.)

Male: Wing length 1.8 mm.; leg ratio 2.1; antennal ratio 1.9.

Dark brown. Antenna beyond scape and palpus brown; legs except coxae and halter except knob stramineous; halter knob mostly black; wing marked with pale gray along the veins, more conspicuously so in the bases of cells R_5 and Cu_1 and along veins Cu_2 and 2A; wing veins pale brown.

Genitalia: Figure 41. Similar to those of *P. simulans* (fig. 40) but the lateral points of the ninth tergite, style, and appendages longer and more slender, and the inferior appendage with 7 to 9 instead of 10 to 14 bristles. The style averages about 6.5 as long as broad and the superior appendage 2.2 as long as broad.

Female: Similar to the male except for the usual sexual differences.

In the absence of the types, the name *halterale* is applied to this species because Coquillett described the leg ratio as being about 2.0. The original description would otherwise fit *P. simulans* or *P. digitifer* equally well. Most records of *P. halterale* in literature are based upon misdeterminations of *P. simulans*.

Material: Male, Davenport, Iowa, June 7, 1940, U. A. Hauber (Hauber); 2 males, Sabine River Ferry opposite Orange, La., June 17, 1920 (Cornell, Townes); male, Plummers Island, Md., August 3, 1912, J. R. Malloch (Townes); 3 males, Plummers

Island, Md., August 25, 1914, R. C. Shannon (USNM); male, Plummers Island, Md., June 8, 1914, R. C. Shannon (Townes); male, Plummers Island, Md., July 16, 1902, H. S. Barber (USNM); 7 males, 1 female, Midland County, Mich., July 20, 1939, R. R. Dreisbach (Townes, Dreisbach); male, Engleton, Okla., June 26, 1937, Standish and Kaiser (Townes); male, Idabel, Okla., June 30, 1937, Standish and Kaiser (Okla.); male, Falls Church, Va., July 8, N. Banks (Harvard).

42. *Polypedilum (Tripodura) digitifer*, new species

Male: Wing length 1.6 mm.; leg ratio 1.65; antennal ratio 1.5. Otherwise, except in genitalia, similar to *P. halterale*.

Genitalia: Figure 42. The shape of the superior appendage easily distinguishes this from closely related species.

Female: Similar to the male except for the usual sexual differences.

Type: Male, James River at Mitchell, S. Dak., June 26, 1940, H. K. Townes (Townes).

Paratypes: Male, Bakersfield, Calif., August 19 to 20, 1917 (Cornell); male, female, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes); 2 males, Plummers Island, Md., July 31, 1912, Barber and Schwarz (Townes); male, Plummers Island, Md., August 22, 1914, R. C. Shannon (USNM); 2 males, Plummers Island, Md., August 25, 1914, R. C. Shannon (USNM, Townes); male, Mackinac, Mich., July 5, 1936, R. R. Dreisbach (Dreisbach); 2 males, Atherton, Mo., July, C. F. Adams (Johannsen, Townes); male, Lugert, Okla., June 11, 1937, Standish and Kaiser (Townes); male, Oswalt, Okla., July 3, 1937, Standish and Kaiser (Okla.); male, Roff, Okla., July 15, 1937, Standish and Kaiser (Okla.); male, Norris Dam, Tenn., June 23, 1940, H. and M. Townes (Townes); and 6 males, Brownsville, Tex., May 4, 1904, H. S. Barber (USNM, Townes).

43. *Polypedilum (Tripodura) griseopunctatum* (Malloch), new combination

Chironomus griesopunctatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:428; type locality: Mokence, Ill. (Ill.).

Male: Wing length 1.8 mm.; leg ratio 1.7; antennal ratio 1.45.

Wing of male with indistinct pale gray spots (fig. 212), often practically lacking. The wing figured is of an unusually well-marked male. Otherwise, except in genitalia, similar to *P. halterale*.

Genitalia: Figure 43. The shape of the superior appendage easily distinguishes this species from those resembling it in external characters. The shape of the inferior appendage is also rather distinctive.

Female: Wing spots larger and darker than those of the male. Otherwise similar to the male except for the usual sexual differences.

Although the wing spotting will distinguish females of this species, the

spots of the male are usually so indistinct that they are only slightly darker than those of *P. halterale*, *P. simulans*, and *P. digitifer* and thus do not offer a reliable character.

Material: Female, Urbana, Ill., July 7, 1915 (Ill.); male, Davenport, Iowa, July 27, 1941, U. A. Hauber (Hauber); male, Plummers Island, Md., May 14, 1914, R. C. Shannon (USNM); female, Plummers Island, Md., June 8, 1914, Schwarz and Shannon (USNM); male, Plummers Island, Md., July 28, 1912, H. L. Viereck (USNM); male, Midland County, Mich., June 8, 1939, R. R. Dreisbach (Townes); male, Midland County, Mich., August 1, 1939, R. R. Dreisbach (Dreisbach); 3 males, Great Falls, Mont., July 7, 1921, H. G. Dyar (USNM, Townes); female, Reno, Nev., August 27, 1915, H. G. Dyar (USNM); male, Atsion, N. J., June 3, 1939, H. K. Townes (Townes); female, Medford Lakes, N. J., June 3, 1939, H. K. Townes (Townes); female, Shokan, N. Y., July 9, 1936, H. K. Townes (Townes); and 2 females, Petersburg, Va., June 1, 1917 (Cornell).

44. *Polypedilum* (*Tripodura*) *acifer*, new species

Male: Wing length 1.3 mm.; leg ratio 1.67; antennal ratio 1.0.

Blackish brown. Flagellum and mouthparts light brown; legs stramineous, the apex of each femur and tibia brownish; wing veins light brown; halter and style whitish.

Genitalia: Figure 44, drawn from the type. The superior appendage is unique for the subgenus, being shaped as in the subgenus *Polypedilum*.

Female: Similar to the male except for the usual sexual differences.

With the superior appendage of the male genitalia shaped as in the subgenus *Polypedilum* and the anal point typical of the subgenus *Tripodura*, this species is difficult to place. Since the tip of vein R_{2+3} seems well separated from R_1 , I am referring it to *Tripodura*.

Type: Male, Osceola County, Mich., June 4, 1940, R. R. Dreisbach (USNM).

Paratypes: Two females, collected with the type (Dreisbach, USNM).

Subgenus POLYPEDILUM

Polypedilum Kieffer, 1913, Bull. Soc. d'Hist. Nat. Metz **28**:15. Genotype: (*Polypedilum emarginatum* Kieffer) = *nubeculosum* (Meigen) (monobasic and original designation).

Pentapelmia Kieffer, 1921, Ann. Soc. Sci. Bruxelles **41**, c. r.: 98. Genotype: *Polypedilum integrum* Kieffer (original designation).

Propedilum Lenz, 1937, Arch. Hydrobiol. Suppl. **15**: 13. Genotype: *Chironomus* (*Polypedilum*) *anticus* Johannsen, not Walker (monobasic). New synonymy.

Wing membrane without macrotrichia; ends of R_1 and R_{2+3} very near together, not distinctly separated except in *P. (P.) nubeculosum* and *P. (P.) trigonus* (figs. 213 to 215); positions of the ends of R_{4+5} and M variable.

Male genitalia: Superior appendage horn-shaped or foot-shaped, always

ending in a point and never with more than one seta beyond the base except in the European *P. (P.) cultellatum* Goetghebuer; anal point slender or broad, never with lateral basal shoulders. See figures 45 to 64.

The species *nubeculosum*, *trigonus*, *laetum*, *nigratum*, and *ontario* are rather isolated and cannot easily be referred to species groups. *P. nubeculosum* has the primitive characters of a well-developed pronotum and veins R_1 and R_{2+3} well separated at their tips. *P. trigonus* agrees with *P. nubeculosum* in the separation of the tips of R_1 and R_{2+3} . The remaining 15 Nearctic species may be divided into 2 groups. The *fallax* group includes *fallax*, *fuscipenne*, *artifer*, *vibex*, *walleyi*, and *pedatum* and is distinguished by the larger size of the species, leg ratio of about 1.4, antennal ratio of about 1.4, and R_{4+5} ending practically at the wing apex. Except for *pedatum*, the genitalia of all the species are similar. Many have the thorax brown and the abdomen largely greenish white. Perhaps *ontario* and *nigratum* are offshoots of the *fallax* group. Apparently all of them breed in the riffles of streams and rivers. The *convictum* group includes *ophioides*, *illinoense*, *brasseniae*, *angustum*, *convictum*, *suliceps*, *cinctum*, *obtusum*, and *aviceps*. These are small species with a leg ratio of 1.4 to 1.85, antennal ratio of about 2.0, and the end of R_{4+5} about as far from the wing apex as is the end of M. Except for *suliceps* they are whitish in color. This species group can be divided into two subgroups: The *illinoense* subgroup including the first four of the species listed and the *convictum* subgroup including the last five. The *illinoense* subgroup has the superior appendage of the male genitalia horn-shaped and the style 3.8 to 5.5 as long as wide, while the *convictum* subgroup has the superior appendage boot-shaped and the style 2.2 to 3.5 as long as wide. Apparently the *illinoense* subgroup are all miners in aquatic plants.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS POLYPEDILUM

1. Thorax blackish brown or brown..... 2
 Thorax whitish or very pale brown..... 15
2. Knob of halter blackish, at least at its apex..... 3
 Knob of halter entirely whitish..... 7
3. Tibiae except at their bases brown, the tarsi white; wing brown; hairs of body and legs dense, long, and strong..... 48. *ontario* (Walley)
 Tibiae and tarsi approximately concolorous; wing hyaline or spotted; hairs of body and legs shorter and less conspicuous..... 4
4. Basal abdominal tergites uniformly blackish brown; ends of veins R_{4+5} and M about equidistant from wing apex; wing usually spotted..... 5
 Basal abdominal tergites partly or entirely pale; end of vein R_{4+5} much nearer than end of M to wing apex; wing not spotted..... 6
5. Pronotum distinct above; spots on wing very pale or absent (fig. 213); leg ratio about 1.55..... 45. *nubeculosum* (Meigen)
 Pronotum reduced to a mere line above; spots on wing more definite (figs. 214A and 214B); leg ratio about 1.25..... 47. *laetum* (Meigen)
6. Apical half of fore femur blackish, the rest of the legs whitish; basal half of abdomen whitish..... 53. *fuscipenne* (Meigen)
 Apical half of fore femur pale brown, concolorous with the rest of the legs; basal half of abdomen whitish with brown transverse band..... 49. *vibex*, new species
7. Abdominal tergites 1 to 5 in male and 1 to 2 in female whitish..... 8
 Abdominal tergites all partly or entirely dark..... 11

8. Apical three segments of abdomen pale; thorax brown.....50. *walleyi*, new species
- Apical three segments of abdomen blackish; thorax blackish.....9
9. Fore femur whitish.....51. *artifer* (Curran)
- Fore femur partly dark brown.....10
10. Wing uniformly pale (male and female).....52a. *fallax* var. *fallax* (Johannsen)
- Wing with a broad gray band covering the central fourth (fig. 215, female only)
- 52b. *fallax* var. *calopterus* (Mitchell)
11. Tips of veins R_1 and R_{2+3} distinctly separated (as in *Tripodura*); abdominal tergites 2 to 6 of male usually with large lateral subtriangular pale marks; wing length about 2.0 mm.46. *trigonus*, new species
- Tips of veins R_1 and R_{2+3} adjacent; abdominal tergites uniformly dark; wing length 2.1 to 3.5 mm12
12. Flagellum whitish or pale brown; superior appendage of male genitalia horn-shaped, narrow at base, rather evenly curved and tapered to the point (fig. 55)
55. *nigrutum*, new species
- Flagellum brown; superior appendage of male genitalia foot-shaped, broad at the base, at the seta abruptly turned and tapered to the point (figs. 54A, 54B, and 60)13
13. Apical part of vein R_{4+5} nearly straight and not ending nearer the wing apex than does vein M; legs and wing veins brown.....60. *sulaceps*, new species
- Apical part of vein R_{4+5} curved and ending much nearer the wing apex than does vein M; legs and wing veins white to stramineous.....14
14. Apical part of vein R_{4+5} moderately curved and not quite reaching wing tip; apical narrow portion of superior appendage shorter (fig. 54A); wing length about 2.5 mm.54a. *pedatum pedatum*, new species
- Apical part of vein R_{4+5} strongly curved and ending at the wing tip; apical narrow portion of superior appendage longer (fig. 54B); wing length about 3.0 mm.54b. *pedatum excelsius*, new subspecies
15. Superior appendage of male genitalia sickle-shaped, without microtrichia near the base of the seta; style about 3.8 to 5.0 as long as broad; anal point slender (figs. 56 to 59)16
- Superior appendage of male genitalia boot-shaped, with microtrichia near the base of the seta; style about 2.2 to 3.5 as long as broad; anal point often broad (figs. 61 to 64)19
16. Superior appendage not strongly curved at the origin of the seta (figs. 56 and 57)17
- Superior appendage strongly curved or bent at the origin of the seta (figs. 58 and 59)18
17. Style about 3.8 as long as broad; inferior appendage very narrow (fig. 56); abdomen uniformly pale.....56. *angustum*, new species
- Style about 5.0 as long as broad; inferior appendage moderately broad (fig. 57); abdominal incisures often darkened.....57. *illinoense* (Malloch)
18. Superior appendage very long and slender, reaching the base of the style and there turning inward toward the middle of the anal point; raised seta-bearing area of ninth tergite more narrow (fig. 58).....58. *ophioides*, new species
- Superior appendage rather broad, not reaching the base of the style and turning inward toward the base of the anal point; raised seta-bearing area of ninth tergite broader (fig. 59).....59. *branseniae* (Leathers)
19. Anal point slender, spine-like (figs. 61 and 62)20
- Anal point broad, definitely flattened above (figs. 63 and 64); abdomen uniformly greenish white or yellowish white.....21
20. Abdomen with a brown band occupying the middle half of each segment; inferior appendage of genitalia extending beyond the end of the anal point (fig. 61); leg ratio about 1.33.....61. *cinclum*, new species
- Abdomen uniformly pale greenish white or yellowish white; inferior appendage of genitalia not or hardly reaching end of anal point (fig. 62); leg ratio about 1.65.....62. *convictum* (Walker)

21. Superior appendage with a prominent tubercle at origin of seta; point of superior appendage about as long as the average width of the appendage (fig. 63); leg ratio about 1.75.....63. *obtusum*, new species
 Superior appendage evenly rounded at origin of seta; point of superior appendage about half as long as the average width of the appendage (fig. 64); leg ratio about 1.50.....64. *aviceps*, new species

45. POLYPEDILUM (POLYPEDILUM) NUBECULOSUM (Meigen)

Chironomus nubeculosus Meigen, 1804, Klass. Besch. europ. zweifl. Ins., p. 18; type locality: ?France (?Paris Museum).

Chironomus nubeculosus Johannsen, 1908, Bull. N.Y. State Mus. 124: 278; description. *Polypedilum nubeculosum* Goetghebuer, 1928, Faune de France 18: 89; description, generic position.

Male: Wing length 3.0 mm.; leg ratio 1.55; antennal ratio 2.1; pronotum forming a distinct projection from the mesoscutum, stronger than in any other species of the genus; hairs between median and lateral lobes of mesoscutum arranged in a single row; R_{2+3} distinctly separated from R_1 , in this way differing from all other species of the subgenus except *P. trigonus*; end of R_{4+5} a little nearer than end of M to wing apex; fork of Cu slightly beyond r-m.

Blackish brown. Flagellum, legs beyond coxae, and halter except the apical part paler brown than the body; wing with pale gray spots as in figure 213, the veins light brown; halter knob blackish. The wing spots are very pale and often practically absent.

Genitalia: Figure 45. The broad ovate style is characteristic.

Female: Similar to the male except for the usual sexual differences.

This species presents two primitive characters: The well-developed pronotum and the separation of R_{2+3} from R_1 . In genitalia and in its well-developed pronotum, it resembles *P. (Pentapedilum) sordens*. I have compared American material with a series of three males and one female from England in the States National Museum, determined by Edwards.

Material: Many males from Idaho (Cataldo); Michigan (Brevort and Manistee County); Minnesota (Hennepin County); and New York (Ithaca, Juanita Island in Lake George, Mayville, Otsego Lake, and Westchester County). Adults have been collected in New York from June 5 to August 27. This species is widespread in central and northern Europe.

46. Polypedilum (Polypedilum) trigonus, new species

Male: Wing length 2.0 mm.; leg ratio 1.6; antennal ratio 2.1; hairs between median and lateral lobes of mesoscutum in a single row; tips of R_1 and R_{2+3} distinctly separated, in this way differing from all other species of the subgenus except *P. nubeculosum*; ends of R_{4+5} and M about equidistant from the wing tip; fork of Cu beyond r-m.

Dark brown. Legs beyond coxae, wing, halter, and a large subtriangular

spot on each side of abdominal tergites 2 to 6 whitish, the base of each triangle being on the apical margin of the tergite; mesosternum, scutellum, top part of mesoscutum, inner half of pedicel, and head usually paler brown.

Genitalia: Figure 46, drawn from the type.

Female: Abdomen entirely dark brown. Otherwise, except for the usual sexual differences, similar to the male.

Type: Male, from bank of cove on Hudson River just south of Hudson, N. Y., August 31, 1936, H. K. Townes (Townes).

Paratypes: Sixty-two males, 4 females, from Arkansas (Galloway and Helena); Florida (West Palm Beach); Idaho (Cataldo and Coeur d'Alene Lake); Louisiana (Mound); Michigan (Midland County); Minnesota (Camp Warren in St. Louis County, Cloquet, and Hennepin County); New Jersey (Riverside and Riverton); and New York (Canadarago Lake, Canajoharie, and Peekskill). Paratypes are in the collections of Townes, United States National Museum, Dreisbach, Minnesota, and Rempel. Adults have been collected from May 1 in Midland County, Mich., to August 30 at Canadarago Lake, N. Y., and October 31 at West Palm Beach, Fla. In the specimens from Coeur d'Alene Lake, Idaho, the pale spots on the abdomen are smaller than usual, while in a male from Galloway, Ark., the pale spots are unusually large and the fifth tergite is almost entirely whitish.

In addition, I have seen four males from Midland County, Mich., collected by R. R. Dreisbach, May 19 and June 1, 1939 (Townes, Dreisbach, and USNM), which differ from the other specimens in having the abdomen entirely blackish brown and the legs and halter brown.

47. *POLYPEDILUM* (*POLYPEDILUM*) *LAETUM* (Meigen)

Chironomus laetus Meigen, 1818, Syst. Besch. europ. zweifl. Ins. 1: 38; type locality: ?France (?Paris Museum).

Polypedilum laetum Goetghebuer, 1928, Faune de France 18: 90; description, generic position.

Male: Wing length 2.6 mm.; leg ratio 1.25; antennal ratio 1.6; hairs between median and lateral lobes of mesoscutum arranged in a partly double row; end of R_{4+5} a little nearer than end of M to the wing apex; fork of Cu very slightly beyond r-m.

Dark brown. Flagellum and legs beyond coxae brown; wing with a milky tinge, marked with brown or pale fuscous spots as shown in figures 214A and 214B, the veins pale brown; halter pale brown, its knob blackish brown.

Genitalia: Figures 47 and 261. The short and rather uniform width of the strongly curved superior appendage are characteristic.

Female: Similar to the male except for the usual sexual differences.

Specimens show considerable variation in the wing spotting. In the series from Reno, Nev., there are 12 specimens distinguished by generally heavier

wing markings, a small spot below the tip of Cu_2 , and a narrow longitudinal spot in cell R_5 just above and not touching vein M (fig. 214B). In the series from Ithaca, N. Y., and from Florissant, Colo., the wing markings are reduced and resemble those of *P. nubeculosum* (fig. 213). There is also variation in the genitalia. The superior appendage may be slenderer and more curved than in figure 47 and the ninth tergite may be somewhat truncate at the apex, making a shoulder on each side of the anal point. Such genitalia are illustrated in figure 261. I have not seen material from Europe, but Nearctic specimens fit the descriptions of *P. laetum* by European authors very well.

Material: Many males and females from Alberta (Edmonton); California (Lake Tahoe); Colorado (Boulder and Florissant); Nevada (Reno); New Mexico (Pecos); New York (Buffalo, Ithaca, Lancaster, and Niagara Falls); and South Carolina (Clemson). Adults have been collected in New York from June 5 to September 17. This species is widespread in Europe.

48. POLYPEDILUM (POLYPEDILUM) ONTARIO (Walley)

Chironomus hirtipes Mitchell, 1908, Jour. N. Y. Ent. Soc. **16**: 9; type locality: Cabin John, Md. (USNM). Name preoccupied by Macquart, 1834.

Chironomus hirtipes Johannsen, 1908, Bull. N. Y. State Mus. **124**: 280; description.

Chironomus ontario Walley, 1926, Canad. Ent. **58**: 206; type locality: Ottawa, Ontario (CNC). New synonymy.

Male: Wing length 3.4 mm.; leg ratio 2.1; antennal ratio 1.3. This species is thickly clothed with long brown hairs on the body, femora, and tibiae. On the abdomen, the hairs occupy only the brown bands, giving it a tufted appearance. Hairs between median and lateral lobes of mesoscutum in a triple to quadruple row; frons protuberant; end of R_{4+5} a little nearer than end of M to wing apex; fork of Cu distinctly beyond r-m.

Pruinose brown. Brownish stramineous as follows: Face, frons, scape, basal segment of flagellum, halter, first abdominal tergite except for a large spot on each side, abdominal tergites 2 to 7 except for a broad subbasal transverse brown band that widens laterally, inferior appendage, and tip of style; legs brown; tarsi and extreme bases of tibiae whitish; wing pale brown, the base stramineous; thorax entirely brown, but some parts lighter or darker than the rest.

Genitalia: Figure 48. The shape of the style and the broadening of the anal point at the base are unique in the genus.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and females from Maryland (Cabin John, Jackson Island, and Plummers Island); New Jersey (Atsion and Delaware Water Gap); New York (Amsterdam, Brainard, Canajoharie, Chatham Center, Hancock, Haverstraw, Ithaca, Kinderhook, Lexington, Malden Bridge, Milford Center, Oneonta, and Salisbury); Ontario (Burke Falls and Ottawa); Pennsylvania (Hazleton); Quebec (Deschenes, Vaudreuil, and Wakefield) and Texas (Devils River). I have found this singular-looking species widespread in New York, but have never taken more than a few specimens in a locality. It probably breeds in large streams. Adults have been collected in central New York from July 5 to August 31; in the vicinity of Washington, D. C., from June 3 to September 24; and at Deschenes, Quebec, on June 27.

49. *Polypedilum (Polypedilum) vibex*, new species

Male: Wing 3.4 mm. long; leg ratio 1.55; antennal ratio 1.48; hairs between the median and lateral lobes of mesoscutum in a single, double, or partly double row; end of R_{4+5} practically at the wing apex; fork of Cu distinctly beyond r-m.

Head and thorax blackish brown or dark brown; antenna, palpi, and wing veins brown; legs stramineous, brownish towards their apices and on more or less of the coxae; front trochanter and base of front femur brown; halter white, the tip of the knob dark brown; abdominal segments 1 to 5 greenish white to pale brown, with a brown subbasal cross band on segments 2 to 5. The brown cross bands are progressively broader towards the caudal segments, that of the second segment occupying about 0.25 of the segment's length and that of the fifth segment occupying about 0.4 of its length. Abdomen beyond the fifth segment blackish brown or dark brown, the style, appendages, and apical part of the sixth and seventh segments somewhat paler.

Genitalia: Figure 49. Similar to those of *P. fallax* (fig. 52).

Female: Ground color of abdomen pale brown, instead of whitish to pale brown as in the male. Otherwise similar to the male except for the usual sexual differences.

Type: Male, Ottawa, Ontario, July 26, 1924, C. H. Curran (CNC).

Paratypes: Two males, 1 female, collected with the type (USNM, CNC); male, Reno, Nev., September 25, 1915, H. G. Dyar (USNM); male, Atsion, N. J., July 30, 1939, H. K. Townes (Townes); 4 males, Ottawa, Ontario, July 31, 1924, August 1, 1924, and August 7, 1924, C. H. Curran (CNC); and female, Glacier, Wash., June 4, 1917, H. G. Dyar (USNM).

50. *Polypedilum (Polypedilum) walleyi*, new species

Male: Wing 3.8 mm. long; leg ratio 1.4; antennal ratio 1.4; hairs between the median and lateral lobes of mesoscutum in a double row; end of R_{4+5} near, and end of M distant from wing apex; fork of Cu distinctly beyond r-m.

Head and thorax brown, the mouthparts, flagellum, and scutellum pale brown; wing with its base brown, the rest whitish and with pale veins; halter white; legs whitish; middle and hind coxae and apices of tarsi pale brown; front coxa and trochanters brown; front femur with the basal 0.85 brownish and the apical 0.15 whitish; abdomen whitish, slightly tinged with brown beyond the fifth segment.

Genitalia: Figure 50, drawn from the type. The slightly broader style is the only point of difference between the genitalia of this species and those of *P. vibex* (fig. 49), of *P. fallax* (fig. 52), and of other closely related species.

Female: Unknown.

Type: Male, Aylmer, Quebec, August 14, 1924, G. S. Walley (CNC).

Paratype: Male, Point Pelee, Ontario, June 10, 1925, G. S. Walley (CNC).

51. *Polypedilum (Polypedilum) artifer* (Curran), new combination

Chironomus artifer Curran, 1930, Bull. Amer. Mus. Nat. Hist. 61: 32; type locality: Tuxedo Park, N. Y. (Amer. Mus.).

Male: Wing length 3.4 mm.; leg ratio 1.43; antennal ratio 1.25. Similar to *P. fallax* (see below) except that the fore femur is entirely white.

Genitalia: Similar to those of *P. fallax* (fig. 52) and of *P. vibex* (fig. 49).

Female: Similar to the typical female of *P. fallax* except that the fore femur is entirely white.

Material: Many males and females from Colorado (Hayden); Iowa (Davenport); Massachusetts (South Hadley); New Jersey (Delaware Water Gap); New York (Chatham Center, Hancock, Hoosick Junction, Ithaca, Kinderhook, McLean, Newport, North Hoosick, North Petersburg, and Valley Falls); Ontario (Burks Falls); Quebec (Ottawa Golf Club); Virginia (Trenton Falls); and Wyoming (Meadow Lake in the Big Horn Mountains at 8,000 ft.). This species is rather common along the banks of medium to large-sized streams with stony bottoms. Adults have been taken in New York from June 23 to September 6 and at South Hadley, Mass., on October 2.

52a. *POLYPEDILUM (POLYPEDILUM) FALLAX* var. *FALLAX* (Johannsen)

Chironomus fallax Johannsen, 1905, Bull. N. Y. State Mus. 86:210; type locality: Ithaca, N. Y. (Johannsen collection).

Chironomus fallax Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:435; description.

Chironomus (Polypedilum) fallax Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:30; description of larva and pupa.

Male: Wing length 3.4 mm.; leg ratio 1.42; antennal ratio 1.3; hairs between median and lateral lobes of mesoscutum arranged in a single row; end of R_{4+5} near, and end of M distant from wing apex; fork of Cu distinctly beyond r-m.

Polished blackish brown, white as follows: Palpus and mouthparts more or less, face sometimes, flagellum (the base often tinged with brown), wing beyond squama, halter, and abdominal segments 1 to 5; legs white except for the apical tarsal segment, basal 0.8 of fore femur, and more or less of coxae, which parts are dark brown; basal 0.4 of fore femur light brown, sometimes whitish; apical 0.65 of wing faintly infusate; style and inferior appendage pale brown.

Genitalia: Figure 52. Similar to those of *P. vibex* (fig. 49).

Female: Usually only the basal two abdominal segments are whitish, the rest being more or less brown. Otherwise, except for the usual sexual differences, similar to the male.

This species, *fuscipenne*, *artifer*, *vibex*, *walleyi*, and the European *acutum* Kieffer are structurally very similar.

Material: Many males and females from Illinois (Centerville, Momence, and Monticello); Indiana (La Fayette); Maine (Machias); Michigan (East Lansing and Midland County); New Hampshire (White Mountains); New York (Brainard, Connecticut Hill in Tompkins County, Dolgeville, Hoosick, Ithaca, Kinderhook, Lake Placid, McLean, Old Forge, Oneonta, Ringwood in Tompkins County, Rome, Slide Mountain, Syracuse, and Tuxedo); Ontario (Costello Lake in Algonquin Park and Ottawa); Pennsylvania (North Mountain); Quebec (Batiscan); Tennessee (Bryson City, Marshall, and Newfound Gap); and Vermont (Woodstock). In central New York, adults have been collected from May 8 to September 4, and at North Mountain, Pa., on November 1. Most of the New York collections were made from the banks of medium-sized streams with stony bottoms.

52. *Polypedilum (Polypedilum) fallax* var. *calopterus*
(Mitchell), new combination

Chironomus calopterus Mitchell, 1908, Jour. N. Y. Ent. Soc. 16:8; type locality: Cabin John, Md. (USNM).

Chironomus (Stenochironomus) calopterus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210: 28; generic position.

This is a female form of *fallax* in which the wing has a broad gray band covering its central fourth (fig. 215). This is the only way it differs from typical *fallax*. Professor O. A. Johannsen tells me that a series was reared from Ringwood, near Ithaca, N. Y., in which females of this form emerged along with males and females of typical *fallax*. I have studied two males of this reared series and cannot distinguish them from typical *fallax*.

Material: Two females, Georgia (Harvard); female, Cabin John, Md., September 18, 1927, H. G. Dyar (USNM); female, Detroit, Mich., August 9, 1933 (USNM); female, Ringwood, near Ithaca, N. Y. (Johannsen); female, Greenville, S. C., April 7, 1933, H. K. Townes (Townes); female, Great Falls, Va., April 28, 1915, R. C. Shannon (USNM); 2 females, no data (Cornell).

53. *Polypedilum (Polypedilum) fuscipenne* (Meigen), new combination

Chironomus fuscipennis Meigen, 1818, Syst. Besch. europ. zweifl. Ins. 1: 35; type locality: ?France (?Paris Museum).

Male: Wing 3.4 mm. long; leg ratio 1.42; antennal ratio 1.3. Similar to *P. fallax* (see above) except that the halter knob is black and that the fore femur has its apical 0.66 entirely dark brown and its basal 0.33 whitish.

Genitalia: Similar to those of *P. fallax* (fig. 52) and of *P. vibex* (fig. 49).

Female: Abdomen blackish with the apical margin of the tergites and obscure lateral areas toward the base of the abdomen whitish. Otherwise similar to the male, except for the usual sexual differences.

I have compared Nearctic material with a male from England in the United States National Museum, determined by Edwards.

Material: Male, 9,000 feet, Creede, Colo., July 9, F. M. Carpenter (Harvard); female, Grand Lake, Colo., August 24, 1940, H. and M. Townes (Townes); male, Missoula, Mont., July 1, 1940, H. and M. Townes (Townes); 2 males, Seaside, Oreg., August 9, 1940, H. and M. Townes (Townes); female, Elbe, Wash., July 25, 1940, H. and M. Townes (Townes).

54a. *Polypedilum (Polypedilum) pedatum pedatum*, new species

Male: Wing 2.5 mm. long; leg ratio 1.2; antennal ratio 1.3; hairs between median and lateral lobes of mesoscutum in a single or partially double row; apical part of R_{4+5} strongly curved and ending nearer than tip of M to the wing apex; fork of Cu beyond r-m.

Blackish brown. Legs beyond coxae, wing, and halter whitish.

Genitalia: Figure 54A. The superior appendage is rather similar in shape to those of *P. brasseniae* (fig. 59), *P. convictum* (fig. 62), and related species. In the subspecies *excelsius* (fig. 54B), the apical part of the superior appendage is longer (see below).

Female: Similar to the male except for the usual sexual differences.

Type: Male, McLean Bogs Reserve, McLean, N. Y. (Cornell).

Paratypes: Female, Sabine River Ferry opposite Orange, La., June 20, 1917 (Cornell); male, Osceola County, Mich., May 10, 1941, R. R. Dreisbach (Dreisbach); 5 females, Atherton, Mo., May 7, 1916, May 7, 1922, August, and September, C. F. Adams (Townes, Johannsen); male, Connecticut Hill at 2,095 feet, Tompkins County, N. Y., June 16, 1937, J. G. Rempel (Rempel); female, Johnstown, N. Y., July 25, 1934, H. K. Townes (Townes); 5 males, 1 female, collected with the type (Cornell); male, McLean Bogs Reserve, McLean, N. Y., August 20, 1925 (Cornell); 10 males, McLean Bogs Reserve, McLean, N. Y., May 17, 1937, J. G. Rempel (Rempel, Townes); and male, 2 females, Mountain Lake, Va., July 11, 1940, July 20, 1940, and July 21, 1940, L. J. and M. J. Milne (USNM).

54b. *Polypedilum (Polypedilum) pedatum excelsius*, new subspecies

Male: Wing 3.0 mm. long; legs beyond coxae pale brown; wing veins pale brown; hairs between median and lateral lobes of mesoscutum usually in a double row, though often in a single row; apical part of R_{4+5} very strongly curved and ending practically at the wing apex. Otherwise as in the subspecies *pedatum*.

Genitalia: Figure 54B, drawn from the type. Point of superior appendage longer and more slender than in the subspecies *pedatum*.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Lake Cushman, Wash., June 27, 1917, H. G. Dyar (USNM).

Paratypes: Male, Clío, Plumas County, Calif., July 9, 1916, H. G. Dyar (USNM); 2 males, Crescent City, Calif., August 2 and 3, 1940, H. and M. Townes (Townes); male, Elbe, Wash., July 13, 1940, H. and M. Townes (Townes); 3 males, Elbe, Wash., July 25, 1940, H. and M. Townes (Townes); 2 males, 1 female, Glacier, Wash., June 4, 1917, H. G. Dyar

(USNM, Townes); 2 males, collected with the type (USNM, Townes); and 5 males, Bremerton, Wash., S. C. Cook (USNM).

55. *Polypedilum (Polypedilum) nigratum*, new species

Male: Wing 2.5 mm. long; leg ratio 1.5; antennal ratio 1.6; hairs between median and lateral lobes of mesoscutum arranged in a single row; end of R_{4+5} nearer than end of M to wing apex; fork of Cu distinctly beyond r-m.

Blackish brown. Flagellum and palpus stramineous or whitish; legs except coxae, wing, and halter white.

Genitalia: Figure 55.

Female: Similar to the male except for the usual sexual differences. The pale flagellum serves to distinguish the female of this species from those resembling it in other characters.

Polypedilum albicorne (Meigen) of Europe is probably the same species as this, but since I have no European material for comparison and can not find a satisfactory figure of the genitalia, its identity is uncertain.

Type: Male, Ithaca, N. Y., September 11, 1935, H. K. Townes (Townes).

Paratypes: Two males, Sandpoint, Idaho, July 1917, H. G. Dyar (USNM); 3 males collected with the type (USNM, Townes); 2 males, 3 females, Ithaca, N. Y., May, July, and September (Cornell); male, Costello Lake in Algonquin Park, Ontario, July 15, 1937, R. B. Miller (Miller).

56. *Polypedilum (Polypedilum) angustum*, new species

Male: Wing 2.3 mm. long; leg ratio 1.55; antennal ratio 1.65. Otherwise, except in genitalia, structurally similar to *P. convictum* (see below).

Yellowish white. Flagellum brown; abdomen more or less tinged with pale green.

Genitalia: Figure 56. The broader style and very narrow inferior appendage distinguish this species from other pale species with a horn-shaped superior appendage.

Female: Unknown.

This species with the eight following seem to be very closely related, all being small with similar venation and an antennal ratio of about 2.0. *P. sulaceps* is the only dark-colored species of the nine.

Type: Male, bank of Rancocas Creek, Riverside, N. J., June 18, 1939, H. K. Townes (Townes).

Paratypes: Male, Atsion, N. J., July 30, 1939, H. K. Townes (Townes); male collected with the type (Townes).

57. POLYPEDILUM (POLYPEDILUM) ILLINOENSE (Malloch)

Chironomus illinoensis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 471; type locality: Carbondale, Ill. (Ill.).

Chironomus illinoensis var. *decoloratus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 472; type locality: Spoon River, near Havana, Ill. (Ill.). New synonymy.

Chironomus (Polypedilum) illinoensis? Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 4; generic position.

Chironomus (Polypedilum) illinoensis Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 61, 63; biology.

Male: Wing 2.3 mm. long; leg ratio 1.85; antennal ratio 2.1. Otherwise, except in genitalia, structurally similar to *P. convictum* (see below).

Whitish yellow. Flagellum brown; abdomen tinged more or less with pale green and with or without posterior margins of tergites 1 to 6 pale fuscous; postnotum, lateral lobes of mesoscutum, and legs often tinged with fuscous or brownish. Although the majority of specimens have the dark abdominal markings and may be recognized by this character, many (the variety *decoloratum* [Mall.]) lack them entirely and are easily confused with related species.

Genitalia: Figure 57. Distinguished from *P. angustum* (fig. 56) by its narrower style and broader inferior appendage; from *P. brasseniae* (fig. 59) by its narrower and straighter superior appendage; and from *P. ophioides* (fig. 58) by its shorter, straighter, and more slender superior appendage bearing the seta near its base.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and females from Alabama (Flatwood in Wilcox County); District of Columbia (Washington); Florida (West Palm Beach); Illinois (Ashley, Burlington, Carbondale, and Spoon River near Havana); Iowa (Davenport); Louisiana (Mound); Maryland (Plummers Island); Michigan (East Lansing, Midland County, and Nigger Creek in Cheboygan County); Minnesota (Jay Cooke State Park); Missouri (Atherton); Montana (Great Falls); New Jersey (Riverton); New York (Canajoharie, Canadarago Lake, Gloversville, Hancock, Hoosick, Ithaca, Kinderhook, Little Falls, Milford Center, Niskayuna, North Petersburg, Otsego Lake, Stillwater, Syracuse, Valley Falls, and Westchester County); Oklahoma (Oswalt); Ontario (Costello Lake in Algonquin Park and Ottawa); Quebec (Hull); South Carolina (Greenville); Texas (Brownsville and New Braunfels); and Virginia (Falls Church). This species may be collected throughout the growing season. It seems to breed more sparingly in lakes than in rivers and streams. Adults have been taken at Ithaca, N. Y., from May 8 to September 18. They have been taken on April 23 at Carbondale, Ill., and on October 9 at Falls Church, Va.

58. Polypedilum (Polypedilum) ophioides, new species

Male: Wing 2.5 mm. long; leg ratio 1.65; antennal ratio 2.0. Otherwise, except in genitalia, structurally similar to *P. convictum* (see below).

Pale yellowish white. Flagellum brown; abdomen often tinged with green.

Genitalia: Figure 58. The long slender superior appendage is distinctive.

Female: Similar to the male except for the usual sexual differences.

Type: Male, from banks of Cadosia Creek just below a wood distilling plant at Cadosia, N. Y., August 6, 1935, H. K. Townes (Townes).

Paratypes: Male, Cataldo, Idaho, July 1, 1940, H. and M. Townes (Townes); male, Douglas Lake, Mich., June 18, 1941, C. O. Berg (C. O. Berg); 12 males, 2 females, collected with the type (Townes); male, Ithaca, N. Y., May 27, 1940, H. and M. Townes (Townes); male, Ithaca, N. Y., May 28, 1935, H. K. Townes (Townes); male, Ithaca, N. Y., September 9, 1941, H. K. Townes (Townes); male, Lake Placid, N. Y., July 1, 1922 (USNM); male, North Hoosick, N. Y., September 4, 1934, H. K. Townes (Townes); male, Otsego Lake, N. Y., September 3, 1935, H. K. Townes (Townes); male, Summit County, Ohio, August 18, 1937, L. J. Lipovsky (Kans.); male, Black Rapids, Rideau River, Ontario, August 12, 1924, F. P. Ide (CNC); male, Woburn, Quebec, June 19, 1928, C. H. Curran (CNC); and male, no data (Cornell).

59. *POLYPEDILUM* (*POLYPEDILUM*) *BRASENIAE* (Leathers)

Chironomus brasseniae Leathers, 1922, Ent. News 33:8; type locality: Spencer Lake, near North Spencer, N. Y. (Johannsen collection).

Chironomus brasseniae Leathers, 1922, Bull. U. S. Bur. Fisheries 38:22-31, figs. 1-25; biology, description of adult and immature stages. (Leather's figure 13 seems to have been based on some other species.)

Chironomus (Polypedilum) brasseniae Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:32; generic position.

Male: Wing 2.5 mm. long; leg ratio 1.85; antennal ratio 2.0. Otherwise, except in genitalia, structurally similar to *P. convictum* (see below).

Yellowish white. Flagellum brown; abdomen tinged with pale green.

Genitalia. Figure 59. The narrow style and broad, bent superior appendage are distinctive.

Female: Not certainly known to me.

Material: Many males from Minnesota (Hennepin County); N. Y. (Canadarago Lake, Ithaca, Kinderhook, Milford Center, Oneonta, and Otsego Lake); Ontario (Ottawa); Oregon (Takenitch Lake); South Carolina (Clemson); and Virginia (Petersburg). In New York, adults have been taken from July 17 to September 18. Collection dates indicate that this species is most common as an adult in August and September. I have only one record for July (July 17) and one earlier than that (June 1 at Petersburg, Va.).

60. *Polypedilum* (*Polypedilum*) *sulaceps*, new species

Male: Wing 2.3 mm. long; leg ratio 1.4; antennal ratio 1.8. Otherwise, except in genitalia, structurally similar to *P. convictum* (see below).

Brown. Flagellum, legs, wing veins, and apical 0.3 of tergites 2 to 7 paler brown; halter white.

Genitalia: Figure 60, drawn from the type. This and *P. pedatum* (figs.

54A and 54B) are the only Nearctic dark-colored species of *Polypedilum* with a boot-shaped superior appendage. The superior appendage of this species differs from that of *P. pedatum* in having a tubercle at the origin of the seta.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Riverdale, Idaho, August 12, 1934, C. F. Smith (genitalia mount, Utah, rest of specimen, USNM).

Paratype: Female, Riverdale, Idaho, September 9, 1934, G. F. Knowlton and C. F. Smith (Utah).

61. *Polypedilum* (*Polypedilum*) *cinctum*, new species

Male: Wing 2.5 mm. long; leg ratio 1.33; antennal ratio 2.0. Otherwise, except in genitalia, structurally similar to *P. convictum* (see below).

Stramineous. Flagellum brown; scape, most of thorax, most of tergites 7 to 9, and a broad subbasal transverse band occupying about 0.5 of abdominal tergites 1 to 6 light brown.

Genitalia: Figure 61, drawn from the type. Differ from those of *P. convictum* (fig. 62) in the shape of the superior appendage and in the length of the inferior appendage.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Reno, Nev., August 5, 1915, H. G. Dyar (USNM).

Paratypes: Thirty-eight males, 12 females, collected on 19 different days from July 4, 1915, to September 2, 1915, and on September 5, 1916, by H. G. Dyar at Reno, Nev. (USNM, Townes).

62. *Polypedilum* (*Polypedilum*) *convictum* (Walker), new combination

Chironomus convictus Walker, 1856, *Insecta Britannica* 3:161; type locality: England (British Museum).

Chironomus flavus Johannsen, 1905, *Bull. N. Y. State Mus.* 86:225; description of larva, pupa, and adult; type locality: Ithaca, N. Y. (Johannsen collection). New synonymy.

Chironomus flaviventris Johannsen, 1907, *Kans. Univ. Sci. Bull.* 4: 111; type locality: Lawrence, Kans. (A male in the collection of the University of Kansas is hereby chosen lectotype.) New synonymy.

Tendipes flavus Bause, 1914, *Arch. Hydrobiol. Suppl.* 2:115; generic position.

Chironomus flavus Malloch, 1915, *Bull. Ill. State Lab. Nat. Hist.* 10:474; description.

Chironomus flavus Muttkowski, 1918, *Trans. Wis. Acad. Sci. Arts Letters* 19:412; biology.

Polypedilum flavus Lenz, 1921, *Deut. Ent. Ztschr.*, p. 158; key to larva.

Chironomus (*Polypedilum*) *convictus* Edwards, 1929, *Trans. Ent. Soc. London* 77:404; description, generic position.

Chironomus flavus Branch, 1931, *Trans. Kans. Acad. Sci.* 34:154; description of eggs.

Chironomus (*Polypedilum*) *flavus* Johannsen, 1938, *Mem. Cornell Univ. Agr. Exp. Sta.* 210:31; description of larva, pupa, and male genitalia.

Male: Wing 2.3 mm. long; leg ratio 1.65; antennal ratio 2.0; hairs between median and lateral lobes of mesoscutum aranged in a single row; ends of R_{4+5} and of M equidistant from wing apex, or the end of R_{4+5} a trifle nearer; fork of Cu distinctly beyond r-m.

Yellowish white. Flagellum brown; abdomen more or less tinged with pale green.

Genitalia: Figure 62. The narrow anal point and boot-shaped superior appendage are distinctive of this species, of *P. cinctum* (fig. 61), of *P. suliceps* (fig. 60), and of *P. pedatum* (figs. 54A and 54B). The present species is distinguishable by the shortness of the inferior appendage and the shorter beak of the superior appendage.

Female: Similar to the male except for the usual sexual differences.

I have examined a series from England in the United States National Museum determined by Edwards, who has studied Walker's type. Nearctic material agrees with most of this series and with Edwards' description and with the descriptions by other European authors. However, there is a specimen of *Polypedilum cultellatum* Goetghebuer, 1931,⁸ in the series which Edwards failed to distinguish, and he may have made a similar error when examining Walker's type. In spite of this uncertainty, it seems best to accept the European interpretation of *C. convictum* Walker and synonymize the American names for the species.

Material: Twenty-three males, 4 females, from Indiana (Indianapolis); Iowa (Davenport); New York (Hancock, Ithaca, Little Falls, and Stillwater); Michigan (Midland County); Missouri (Atherton); Pennsylvania (Trout Run); Rhode Island (Westerly); and South Carolina (Greenville). Adults have been collected from May 29 at Trout Run, Pa., to September 12 at Ithaca, N. Y. This species appears to breed only in the riffles of streams and rivers. It is widespread in Europe.

63. *Polypedilum* (*Polypedilum*) *obtusum*, new species

Male: Wing 2.2 mm. long; leg ratio 1.75; antennal ratio 2.0. Otherwise, except in genitalia, structurally similar to *P. convictum* (see above).

Yellowish white. Flagellum brown; abdomen more or less tinged with pale green.

Genitalia: Figure 63, drawn from the type. Similar to those of *P. aviceps* (fig. 64) in the broad anal point, but distinguished by the broader inferior appendage and differently shaped superior appendage.

Female: Unknown.

Type: Male, taken at night from a lighted store window at Hancock, N. Y., July 24, 1935, H. K. Townes (Townes).

⁸ The specimen of *P. cultellatum* mentioned above is a male from Ruislip, Middlesex, England, September 7, 1914, F. W. Edwards. The mesoscutal stripes are very pale yellowish brown and the leg ratio 1.5. The species has not previously been recorded from England.

Paratypes: Twenty-five males from Michigan (Midland County), and New York (Canaoharie, Hancock, Ithaca, Johnstown, Kast Bridge, North Hoosick, and North Petersburg). These are in the collections of Townes, Rempel, and Dreisbach. Adults have been collected from May 30 in Midland County, Mich., to September 12 at Ithaca, N. Y. Most of the specimens were taken from the banks of stony bottomed streams or rivers.

64. *Polypedilum* (*Polypedilum*) *aviceps*, new species

Male: Wing 2.5 mm. long; leg ratio 1.50; antennal ratio 2.0. Otherwise, except in genitalia, structurally similar to *P. convictum* (see above).

Yellowish white. Flagellum brown; abdomen tinged with pale green.

Genitalia: Figure 64. Similar to those of *P. obtusum* (fig. 63) in the broad anal point, but distinguished by the narrow inferior appendage and differently shaped superior appendage.

Female: Unknown.

Type: Male, Ithaca, N. Y., September 11, 1935, H. K. Townes (Townes).

Paratypes: Twenty-three males, from California (San Jose); Idaho (Sweetwater); Montana (Missoula); Nevada (Reno); and New York (Herkimer, Ithaca, Oneonta, and Stratford). These are in the collections of Townes, Rempel, United States National Museum, and Harvard.

Subgenus PENTAPEDILUM

Pentapedilum Kieffer, 1913, Bull. Soc. d'Hist. Nat. Metz 28:25. Genotype: (*Pentapedilum stratiotale* Kieffer) = ?*tritum* Walker (designated by Edwards, 1929, Trans. Ent. Soc. London 77:376).

Wing membrane with numerous macrotrichia; ends of R_1 and R_{2+3} near together; end of M nearer the wing apex than is the end of R_{4+5} .

Male genitalia: Superior appendage horn-shaped, never with more than one bristle beyond the base; anal point narrow, without lateral shoulders. See figures 65 to 67.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS PENTAPEDILUM

1. Hairs between median and lateral lobes of mesoscutum arranged in a double row; leg ratio 1.1 to 1.4; abdomen paler at the incisures; style of male genitalia ovate65. *sordens* (Wulp)
- Hairs between median and lateral lobes of mesoscutum arranged in a single row or rarely a few hairs out of line, making a partially double row; leg ratio 1.55 to 1.7; abdomen not paler at the incisures; style of male genitalia sublinear..... 2
2. Color brownish; wing length about 2.1 mm.66. *tritum* (Walker)
- Color whitish; wing length about 1.35 mm.67. *album*, new species

65. *Polypedilum* (*Pentapedilum*) *sordens* (Wulp), new combination

Tanytarsus sordens Wulp, 1873, Tijdsch. voor Ent. 17:141; type locality: Netherlands (location of type unknown).

Tanytarsus fulvescens Johannsen, 1905, Bull. N. Y. State Mus. **86**: 293; type locality: Ithaca, N. Y. (Johannsen collection). New synonymy.

Pentapedilum (*Pentapedilum*) *sordens* Edwards, 1929, Trans. Ent. Soc. London **77**: 376; description, generic position.

Pentapedilum (*Pentapedilum*) *fulvescens* Johannsen, 1934, Jour. N. Y. Ent. Soc. **42**:352; generic position.

Male: Wing 2.4 mm. long; leg ratio 1.2; antennal ratio 2.0; hairs between median and lateral lobes of mesoscutum arranged in a double row; pronotum stronger above than in *P. tritum* or in *P. albulum*. This is a very hairy species.

Blackish brown. Legs dark brown; knob of halter black; apical 0.25 of abdominal tergites cinereous.

Genitalia: Figure 65. The style is broader than in other Nearctic species of *Pentapedilum*, *P. nubeculosum* (fig. 45) of the subgenus *Polypedilum* has very similar genitalia. The characteristic seta near the middle of the superior appendage of the subgenera *Polypedilum* and *Pentapedilum* is often absent in this species, or it may occur near the base of the appendage.

Female: Similar to the male except for the usual sexual differences.

I have compared Nearctic material with a series of three males and one female from England, determined by Edwards.

Material: Many males and females from Michigan (Manistee County, Missaukee County, and Third Sister Lake in Washtenaw County); New York (Canadarago Lake, Chautauqua Lake at Mayville, Ithaca, McLean, Old Forge, and Oneonta); Rhode Island (Kingston), and Virginia (Mountain Lake). Adults have been taken in New York from June 7 to August 30, and Mr. C. O. Berg has reared specimens from Third Sister Lake in Washtenaw County, Mich., as early as May 3. The usual breeding place of this species is in lakes. It is widespread in Europe.

66. *Polypedilum* (*Pentapedilum*) *tritum* (Walker), new combination

Chironomus tritus Walker, 1856, Insecta Britannica **3**:162, 342; type locality: England (British Museum).

Pentapedilum (*Pentapedilum*) *tritum* Edwards, 1929, Trans. Ent. Soc. London **77**:376; description, generic position.

Pentapedilum fulvescens? Townes, 1937, Ann. Rpt. N. Y. State Conservation Dept. **27**, suppl.: 171; biology, misdetermination of *fulvescens* Johannsen.

Male: Wing 2.1 mm. long; leg ratio 1.6; antennal ratio 1.7; hairs between median and lateral lobes of mesoscutum arranged in a single row.

Brown. Legs pale brown; mesoscutum shining, only slightly pruinulent; knob of halter black; abdomen somewhat darker at the incisures.

Genitalia: Figure 66. Often the style is somewhat broader and the superior appendage narrower than figured.

Female: Similar to the male except for the usual sexual differences.

I have studied a series of four males and one female in the United States National Museum from England, determined by Edwards.

Material: Many males and females from the District of Columbia (Washington) Florida (West Palm Beach); Idaho (Cataldo and Coeur d'Alene Lake); New Jersey (Atsion and Riverton); New York (Campfire Club at Millwood, Canadarago Lake, Chautauqua Lake, and Otsego Lake); and Virginia (Mountain Lake). This species breeds in sandy muck bottoms of lakes and of slower streams and rivers. Collection dates of adults range from June 3 at Atsion, N. J., and June 21 at Canadarago Lake, N. Y., to September 3 at Otsego Lake, N. Y., and October 21 at West Palm Beach, Fla. It is known also from Belgium, England, and Germany.

67. *Polypedilum* (*Pentapedilum*) *album*, new species

Male: Wing 1.35 mm. long; leg ratio 1.7; antennal ratio 1.2; hairs between median and lateral lobes of mesoscutum arranged in a single row. The wing differs from that of other species of *Pentapedilum* in having the basal half wedge-shaped, the anal angle much reduced, and the fork of Cu farther beyond r-m than usual. These wing characters are all coincident with very small size in the Tendipedidae and it is interesting to see them repeated in this, the smallest species of *Pentapedilum*.

Pale yellowish white, apex of each femur pale brown.

Genitalia: Figure 67, drawn from the type.

Female: Unknown.

Type: Male, Mud Pond, McLean Reservation, Courtland County, N. Y., August 17, 1925 (Cornell).

Paratype: Male, collected with the type (Townes).

Genus TANYTARSUS

Palpus with 4 segments; male flagellum with 13 segments; antennal ratio 1.7 to 4.3; frontal tubercles lacking; pronotum narrow medially, divided at the center by a median notch and slightly projecting on each side of the notch, about even with the anterior end of the mesoscutum or slightly surpassed by it (figs. 230 and 236); squamal fringe present; ends of R_{4+5} and M about equidistant from the wing apex; leg ratio 0.9 to 1.65; tarsal beard present or absent; fore tibia with an apical internal triangular scale with a rounded end or sometimes with a minute apical spine on the end of the scale, the scale about 0.6 as long as the apical diameter of the tibia (fig. 249); pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present; superior appendage horn-shaped or horn-shaped with an expanded base; inferior appendage spatulate, with numerous bristles; inner apical setae of the style numerous, some of them forked at the apex. See figures 69 to 87.

KEY TO THE NEARCTIC SUBGENERA OF TANYTARSUS

1. Middle tibial combs with two spines; flagellum of female with the first and second segments separated by an articulation; wing membrane without hairs.....*Endochironomus* p. 64

- Middle tibial combs with a single spine; flagellum of female with the first and second segments fused..... 2
2. Wing membrane hairy..... *Tanytarsus* p. 71 3
3. Hind tibial combs with two spines, the inner spine very small (fig. 255) or rarely absent; mesoscutum without a tubercle at its center..... *Tribelos* p. 66
- Hind tibial combs with a single spine (fig. 256); mesoscutum with a small tubercle at its center..... *Stictochironomus* p. 77

Subgenus ENDOCHIRONOMUS

Endochironomus Kieffer, 1918, Ann. Mus. Nat. Hungarici 16:69. Genotype: (*Chironomus alismatis* Kieffer) = *tendens* Fabricius (original designation).

Female flagellum with 6 segments; wing membrane without macrotrichia; fork of Cu somewhat beyond r-m; ends of R₁ and R₂₊₃ slightly separated; combs of middle and hind tibiae adjacent or fused, each pair with two short spines.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS ENDOCHIRONOMUS

1. Thorax blackish brown to light brown; scale at the end of fore tibia with a small spine at its apex; fore tarsus of male with a short beard..... 68. *nigricans* (Johannsen)
- Thorax pale greenish, marked with pale orange brown; scale at the end of fore tibia with a very small spine at its apex; fore tarsus of male with a long beard..... 69. *subtendens*, new species

68. *Tanytarsus* (*Endochironomus*) *nigricans* (Johannsen), new combination

Chironomus nigricans Johannsen, 1905, Bull. N. Y. State Mus. 86:219; type localities: Ithaca, N. Y., and New Jersey (Johannsen Collection); description of larva, pupa, and adult.

Chironomus johnsoni Kieffer, 1906, Genera Ins. 42:19; *nomen nudum*.

Tendipes nigricans Bause, 1914, Arch Hydrobiol. Suppl. 2: 115; generic position.

Chironomus nigricans Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:434; description of larva, pupa, and adult.

Stictochironomus nigricans Lenz, 1921, Deut. Ent. Ztschr., p. 161; generic position.

Chironomus nigricans Richardson 1921, Bull. Ill. State Lab. Nat. Hist. 14: 42; biology.

Chironomus nigricans Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15:381, 418; biology.

Chironomus nigricans Bill, 1932, Psyche 39:68; biology.

Chironomus (*Endochironomus*) *nigricans* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:34; description of larva and pupa.

Chironomus nigricans Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 172; biology.

Chironomus (*Endochironomus*) *nigricans* Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:35, 45, 61, 63; biology.

Chironomus (*Endochironomus*) *nigricans* Lindeman, 1942, Amer. Midland Nat. 27: 435-436; biology.

Male: Wing 4.0 mm. long; leg ratio 1.12; antennal ratio 2.75; fore tarsus with a short beard; scale at end of front tibia with a spine at its tip which is about 0.3 as long as the scale, making the scale appear to end in a sharp point.

Blackish brown. Legs, wing veins, and halter whitish; abdomen pale green with the apical part somewhat darkened, sometimes the incisures darkened

and rarely the tergites above somewhat infuscate. Occasional specimens may have the thorax light brown instead of blackish brown. Most of the pale-colored specimens I have seen came from California, Oregon, Washington, South Dakota, and Michigan. At Crescent City, Calif., I found the paler individuals about as common as the normal ones. Specimens collected at Sylvan Lake and at Mitchell, S. Dak., were mostly pale and averaged smaller than usual (wing length 3.4 mm.).

Genitalia: Similar to those of *T. subtendens* (fig. 69).

Female: Thorax brown; coxae more or less brownish; abdomen, especially towards its apex, more or less infuscate. Otherwise similar to the male except for the usual sexual differences.

Material: Many males and females from Alberta (Edmonton and Wabamun); British Columbia (Oliver and Royal Day); California (Crescent City and Palo Alto); District of Columbia (Washington); Florida (West Palm Beach); Hudson Bay Territory; Idaho (Cataldo); Illinois (Burlington, Carbondale, and Havana); Iowa (Daveport); Louisiana (Schriver); Maryland (Marshall Hall and Plummers Island); Manitoba (Carroll); Massachusetts (Amherst, New Bedford, South Hadley, West Springfield, Wilmington, Woods Hole, and Worcester); Michigan (Agricultural College, Ann Arbor, Bay County, Carp Lake in Emmet County, Detroit, East Lansing, Isabella County, Manistee County, Mason County, Mecosta County, Midland County, Missaukee County, and Newaygo County); Minnesota (Beltrami County, Camp Warren, Cass Lake, Crystal Lake, Itasca Park, Plummer, St. Louis County, and St. Paul); Missouri (Kansas City and 2 miles west of St. Louis); North Carolina (Raleigh); New Jersey (Culver's Lake, Riverton, Westville, and Woodbury); New York (Barrytown, Canadarago Lake, Canajoharie, Castle Point, Cobleskill, Croton Reservoir, Germantown, Glenida Lake, Hancock, Hudson, Ithaca, Kensico Reservoir, Mahopac Lake, McLean, Milford Center, Niskayuna, North Evans, Otsego Lake, Poughkeepsie, Staatsburg, and Tuxedo); Oklahoma (Grant); Ontario (Black Rapids in the Rideau River, Costello Lake in Algonquin Park, Jock River, Ottawa, Point Pelee, and Trenton); Oregon (Corvallis, Independence, and Klamath Falls); Quebec (Covey Hill, Ottawa Golf Club, and Vandreuil); Rhode Island (Westerly); South Dakota (Ardmore, Custer, Mitchell, Sylvan Lake in the Black Hills, and Waubay); Virginia (between Bellview and Difficult Run, Great Falls, North Alexandria, and Trammel's Landing on the Potomac River); and Washington (Ashford, Westport, and Yelm). Adults may be collected throughout the growing season. In Central New York, they have been taken from May 7 to September 24, and at South Hadley, Mass., on October 2.

69. *Tanytarsus* (*Endochironomus*) *subtendens*, new species

- Chironomus viridis* Malloch, 1915, Bull. Ill. State Nat. Hist. 10:449; description of larva, pupa, and adult; misdetermination of *viridis* Macquart.
Chironomus viridis Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:412; biology; misdetermination of *viridis* Macquart.
Chironomus (*Endochironomus*) *viridis* (of Malloch) Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:36; description of larva and pupa.
Chironomus viridis (of Malloch) Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 172; biology.

Male: Wing 3.6 mm. long; leg ratio 1.12; antennal ratio 2.75; fore tarsus with a long moderately dense beard; scale at end of fore tibia with a small apical spine which is only about 0.1 as long as the scale.

Pale whitish green. Flagellum and mouthparts fuscous; thorax extensively

marked with pale orange brown; wing, halter, and legs whitish; abdomen slightly darkened toward its apex. Specimens from Colorado have the abdomen unusually deep green.

Genitalia: Figure 69. Indistinguishable from those of other members of the subgenus.

Female: Colored like the male and otherwise similar to the male except for the usual sexual differences.

This species is very close to *T. tendens* (Fabricius) and to *T. albipennis* (Meigen) of Europe. It differs from *tendens* in that the male has a longer tarsal beard and that the female is pale green rather than pale brown. It differs from *albipennis* in having a shorter spine at the tip of the front tibial scale and in having paler thoracic markings.

Type: Male, south bank of Mohawk River just below Niskayuna, N. Y., August 23, 1934, H. K. Townes (Townes).

Paratypes: About 325 males and females from Alberta (Chipewyan, Edmonton, Lethbridge, Tilley, and Wabamun); Colorado (Fort Collins); Illinois (Algonquin and Havana); Iowa (Davenport and Dickinson); Maine (Orono); Manitoba (Aweme and Winnipeg); Massachusetts (Cambridge, Holliston, South Hadley, West Springfield, and Worcester); Michigan (Ann Arbor, Mason County, Midland County, and Osceola County); Minnesota (Cass Lake, Crookston, Crystal Lake, Fish Hatchery in Lesueur County, Hennepin County, Highwood Park, Itaska Park, St. Louis County, and St. Paul); New Jersey (Westville); New York (Canadarago Lake, Chautauqua Lake, Glenida Lake, Ithaca, Kensico Reservoir, McLean, Milford Center, Niskayuna, Otsego Lake, and Tuxedo); Ontario (Black Rapids in the Rideau River, Ottawa, and Trenton); and Saskatchewan (Attons Lake at Cut Knife). Paratypes are in the collections of Cornell, Rempel, Townes, Colorado, Harvard, Dreisbach, United States National Museum, American Museum, Hauber, Alberta, Minnesota, and Sabrosky. Adults are common near the shores of eutrophic lakes throughout the growing season. They have been collected at South Hadley, Mass., from May 14 to October 2, and at other localities from April 28 at Havana, Ill., to December 10 at Edmonton, Alberta. It seems probable, however, that the date of December 10 applies to laboratory reared specimens.

Tribelos, new subgenus

Genotype: (*Chironomus dimorphus* Malloch) = *jucundus* (Walker), variety.

Female flagellum with 5 segments; wing membrane without macrotrichia; fork of Cu beyond r-m; ends of R_1 and R_{2+3} distinctly separated; tarsal beard lacking except in *T. (Tribelos) quadripunctatus*; combs of middle and hind tibiae fused or very narrowly separated, the middle pair with one short spine and the hind pair with two short spines, of which the inner spine is very small (fig. 255).

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS TRIBELUS

1. Abdominal tergites 1 to 6 dark brown with the apical 0.25 of each tergite pale grayish brown; hairs on anterior wing veins very long and dark.....70. *fuscicornis* (Malloch)
 Abdominal tergites 1 to 6 with not more than the apical 0.1 paler than the rest (though often with the basal part paler than the apical part); hairs on anterior wing veins usually of normal length and often pale..... 2
2. Palpus very short, the second segment about 2.0 as long as wide; wing length about 4.8 mm.71. *quadripunctatus* (Malloch)
 Palpus of normal length, the second segment at least 4.0 as long as wide; wing length 2.8 to 4.2 mm. 3
3. Femora brown to blackish brown; hind coxa blackish..... 4
 Femora white to stramineous; hind coxa mostly whitish..... 5
4. Wing length about 2.95 mm.; leg ratio about 1.15; superior appendage of male genitalia simple, horn-shaped (fig. 72).....72. *aler*, new species
 Wing length about 3.8 mm.; leg ratio about 1.3; superior appendage of male genitalia with a strong inner lobe (as in *T. jucundus*, figs. 74A and 74B).....
 73. *protectus*, new species
5. Abdominal tergites 1 to 5 of male uniformly dark or with the incisures paler; lateral lobe of mesoscutum not strikingly darker than the central lobe.....
 74a. *jucundus* var. *dimorphus* (Malloch)
 Abdominal tergites 1 to 5 of male stramineous with the apical 0.4 of tergites 2 to 4 blotched with black; lateral lobe of mesoscutum much darker than the central lobe74b. *jucundus* var. *jucundus* (Walker)

70. *Tanytarsus* (Tribelos) *fuscicornis* (Malloch), new combination

Chironomus fuscicornis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:466; type locality: Havana, Ill. (Ill.).

Male: Wing 2.8 mm. long; leg ratio 1.6; antennal ratio 2.7; palpus of normal length, the second segment about 7.0 as long as wide; hairs on anterior wing veins unusually long.

Dark brown. Legs stramineous, the coxae and fore tibia and tarsus brown; wing somewhat suffused with yellowish brown, the veins brownish and the hairs on anterior veins dark brown; halter whitish, the knob light brown; apical 0.25 of tergites 1 to 6 pale grayish brown; style and apical part of inferior appendage light brown.

Genitalia: Figure 70. The slender style and appendages are like those of many species of the subgenus *Tanytarsus* (figs. 79 to 82).

Female: Colored like the male except that the legs and wing are a little darker and the seventh tergite has a pale border like those of the preceding tergites.

Material: Many males and females from Alabama (Leroy and Sheffield); Florida (West Palm Beach); Maryland (Plummers Island); Michigan (East Lansing); Minnesota (Taylor's Falls); Missouri (Atherton); North Carolina (Rockingham); Oklahoma (Chickasha, Eagleton, Fort Gibson, Gore, and Idabel); and Tennessee (Rives). Adults have been collected at Plummers Island, Md., from June 3 to August 17; at East Lansing, Mich., on September 8; and at West Palm Beach, Fla., on October 5.

71. *Tanytarsus* (Tribelos) *quadripunctatus* (Malloch),
new combination

Chironomus albistria Needham, 1908, in Hankinson: A Biological Survey of Walnut Lake, Mich., p. 255-257; biology, description of larva and pupa, misdetermination of *albistria* Walker.

Chironomus albistria Johannsen, 1908, Bull. N. Y. State Mus. 124:281; description, misdetermination of *albistria* Walker.

Chironomus quadripunctatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:437; type locality; Lake Delavan, Wis. (Ill.).

Chironomus quadripunctatus Carpenter, 1928, Ent. News 39:186-189; biology and description of larva, pupa, and adult.

Chironomus (*Endochironomus*) *quadripunctatus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:36; description of larva and pupa.

Male: Wing 4.8 mm. long; leg ratio 1.1; antennal ratio 2.7; palpus unusually short and stout, the second segment only about 2.0 as long as wide; hairs on anterior wing veins of normal length; fore tarsus with a long sparse beard.

Head and thorax red brown, the abdomen blackish brown; entire body with a velvet-like appearance. Legs stramineous, their coxae red brown; halter whitish, its knob tinged with brown; wing veins pale.

Genitalia: Figure 71. Resemble those of the subgenus *Endochironomus* (fig. 69), but the apical part of the style is not so stout and the inferior appendage is longer and more slender.

Female: Similar to the male except for the usual sexual differences.

The group of four small shiny spots near the median hind margin of each tergite described by Malloch, and of which an exaggerated figure is given by Carpenter, seems to occur more or less distinctly in many species of *Tanytarsus*.

Material: Male, female, Jacksonville, Fla., A. T. Slosson (U.S.NM); male, Walnut Lake, Mich., 1906 (Cornell); female, Franconia, N. H. A. T. Slosson (Amer. Mus.); male, Kearney, Ontario, August 6, 1925, F. P. Ide (CNC); male, Point Pelee, Ontario, June 15, 1924, F. P. Ide (USNM); female, Knowlton, Quebec, August 8, 1929, L. J. Milne (CNC).

72. *Tanytarsus* (Tribelos) *ater*, new species

Male: Wing 2.95 mm. long; leg ratio 1.15; antennal ratio 2.0; palpus somewhat shorter than usual, the second segment about 4.5 as long as wide; hairs on anterior wing veins of normal length.

Blackish brown. Antenna beyond scape brown; wing veins brown; halter white tinged with fuscous; legs except coxae brown.

Genitalia: Figure 72.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Mt. Vernon, Va., "bred from red tube worm" (USNM).

Paratypes: Two males, 4 females, same data as the type (USNM).

Townes); male, Midland County, Mich., May 1, 1941, R. R. Dreisbach (USNM); 2 males, Nine Mile Creek, Hennepin County, Minn., May 22, 1934, Donald Denning (Minn., Townes); male, Ayler, Quebec, May 28, 1923, C. H. Curan (CNC).

73. *Tanytarsus* (Tribelos) *protectus*, new species

Male: Wing 3.8 mm. long; leg ratio 1.3; antennal ratio 3.0; palpus of normal length, the second segment about 5.0 as long as wide; hairs on anterior wing veins of normal length.

Blackish. Wing veins infusate; halter somewhat infusate, its basal and apical parts rather dark; legs beyond coxae brown.

Genitalia: Similar to those of *T. jucundus* (figs. 74A and 74B) but the style slightly narrower toward its apex.

Female: Similar to the male except for the usual sexual differences.

This species is close to *T. intextus* (Walker) of Europe. *T. intextus* differs in having the superior appendage of the male genitalia narrower at its base, with the outer tubercle practically absent and the inner lobe of a slightly different shape.

Type: Male, Otsego Lake, N. Y., June 19, 1935, H. K. Townes (Townes).

Paratypes: Male, Clementon, N. J., May 16, 1897, C. W. Johnson (Harvard); 2 males, Babylon, N. Y., August 8, 1938, H. K. Townes and F. S. Blanton (Townes); 9 males, 4 females, Otsego Lake, N. Y., June 19, 1935, June 25, 1935, and July 18, 1935, H. K. Townes (Townes, Rempel).

74. *Tanytarsus* (Tribelos) *jucundus* (Walker), new combination

Male: Wing about 3.2 to 4.2 mm. long; leg ratio about 1.15 to 1.4; antennal ratio 2.6; palpus of normal length, its second segment about 5.0 as long as wide; hairs on anterior wing veins of normal length.

Head and thorax either testaceous with the postnotum and sometimes the lateral lobes of the mesoscutum darker, or blackish, or sometimes intermediate between the two color types; abdomen blackish with the apical 0.1 of tergites 1 to 6 grayish and with or without pale blotches or an irregular narrow to wide pale band on the basal part of each; palpus paler than the thorax; wing veins, halter, and legs stramineous or whitish.

Genitalia: Figures 74A and 74B. The differences between the two genitalia figured are due to individual variation. Very similar to the genitalia of *T. protectus*, but the style slightly broader towards its apex.

Female: Head and body entirely blackish. Otherwise similar to the male except for the usual sexual differences.

The males of this species may be sorted into two well-marked color varie-

ties, of which one, the variety *jucundus*, is restricted to the Atlantic States from Long Island to Georgia and the other, the variety *dimorphus*, occurs throughout the range of the species. These two varieties are described below.

Material: See under the varieties.

**74a. *Tanytarsus (Tribelos) jucundus* var. *dimorphus* (Malloch),
new combination**

- Chironomus dimorphus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:464; type locality: Carbondale, Ill. (Ill.).
Chironomus fusciventris Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:465; type locality: Delavan Lake, Wis. (Ill.). New synonymy.
Chironomus (Endochironomus) dimorphus Johannsen, 1938, Mem. Cornell Univ. Agr. Sta. 210:35; description of larva and pupa.
Chironomus dimorphus Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 165, 171; biology.
Chironomus (Endochironomus) dimorphus Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 4; biology.

Male: Head and thorax usually testaceous, but sometimes blackish; abdomen blackish brown, the incisures paler and sometimes with pale blotches or an irregular pale band in the basal 0.4 of tergites 1 to 6.

Female: Not distinguishable from that of the typical variety.

The early-season generation (or generations?) consists of individuals that are larger and more robust than those of later generations. The early-season form has a wing length of about 4.0 and a leg ratio of about 1.22. In the later-season form the wing length is about 3.3 mm. and the leg ratio is about 1.35.

Material: Many males (and females collected with the males) from Alberta (Gull Lake); District of Columbia (Washington); Idaho (Sandpoint); Illinois (Carbondale); Manitoba (Aweme); Maryland (Plummers Island); Massachusetts (Cambridge and Worcester); Michigan (Alto, Cheboygan, Detroit, Douglas Lake, East Lansing, Isabella County, Mason County, Mecosta County, Midland County, Newaygo County, Osceola County, and Roscommon County); Montana (Whitefish); New Jersey (Atsion, Cheslhurst, Lakehurst, Riverton, and Tabernacle); New York (Bemus Point, Canadarago Lake, Chatham Center, Grand Island, Hancock, Ithaca, Milford Center, Oneonta, Otsego Lake, Syracuse, Westchester County, and West Galway); Oklahoma (Eagleton, Muse, and Sherwood); Ontario (Black Rapids in the Rideau River, Cayuga, Honey Harbor, Kearney, Orillia, Ottawa, and Washago); Quebec (Aylmer, Covey Hill, Hull, Knowlton, Megantic, Wakefield, and Vaudreuil); South Carolina (Table Rock State Park in Pickens County); Virginia (Mountain Lake and Rosslyn); and Wisconsin (Madison). The species breeds in lakes, ponds, rivers, and streams. Adults occur throughout the growing season. They have been collected from April 23 at Carbondale, Ill., to October 2 at Honey Harbor, Ontario. The larger, more robust early-season form has been collected in New York from May 20 to June 26 and elsewhere from April 23 at Carbondale, Ill., to July 3 at Sandpoint, Idaho. The smaller, more slender later-season form has been collected in Ontario from June 5 to October 2 and at Washington, D.C., from May 27 to September 26.

**74b. *Tanytarsus (Tribelos) jucundus* var. *jucundus* (Walker),
new combination**

- Chironomus jucundus* Walker, 1848, List Dipterous Ins. Brit. Mus. 1:16; type locality: Georgia (British Museum).

Male: Wing 3.3 mm. long; leg ratio 1.35; head and thorax pale cinereous testaceous with the postnotum and usually the lateral lobes of the mesoscutum dark reddish brown; abdominal tergites 1 to 5 stramineous, the first usually with a few black spots and the rest with large black blotches or an irregular black band in their posterior 0.5; the rest of the abdomen blackish with a few paler blotches.

Female: Not distinguishable from the female of the variety *dimorphus*.

Professor O. A. Johannsen, who has seen the type in the British Museum, tells me that Edwards had placed it in the collection under the subgenus *Endochironomus*. Aside from this note, I have only the original description for the identification of Walker's species.

Material: Eight males, Atsion, N. J., June 3, 1939, H. K. Townes (Townes); 2 males, Lakehurst, N. J., August 5, 1939, H. K. Townes (Townes); male, Riverside, N. J., June 18, 1939, H. K. Townes (Townes); 2 males, Babylon, N. Y., August 8, 1938, H. K. Townes and F. S. Blanton (Townes); and 5 males, Greenville, S. C., June 20, 1940, H. K. Townes (Townes). I have also collected many females with males of this variety.

Subgenus TANYTARSUS

Tanytarsus Wulp, 1874, Tijdschr. Ent. 17:134. Genotype: *Chironomus punctipes* Wiedemann (designated by Coquillett, 1910, Proc. U. S. Nat. Mus. 37:612). *Lauterbornia* Kieffer, 1911, Bull. Soc. d'Hist. Nat. Metz 27:42. Genotype: *Chironomus coracinus* Zetterstedt (monobasic and original designation). New synonymy. *Phaenopsectra* Kieffer, 1921, Ann. Soc. Sci. Bruxelles 40, c. r.: 274, 275. Genotype: (*Chironomus leucolabis* Kieffer) = *flavipes* (Meigen) (by present designation). New synonymy.

Sergentia Kieffer, 1922, Bull. Soc. Ent. France 1921:288. Genotype: (*Sergentia profundorum* Kieffer) = *coracinus* (Zetterstedt) (monobasic and original designation). New synonymy.

Lenzia Kieffer, 1922, Ann. Soc. Sci. Bruxelles 41, c. r.: 360. Genotype: *Lenzia albiventris* Kieffer (monobasic).

Female flagellum with 5 segments; wing membrane with numerous macrotrichia; fork of Cu under or somewhat beyond r-m; ends of R₁ and R₂₊₃ very near together; combs of middle and hind tibiae fused or very narrowly separated, the middle pair with one short spine and the hind pair with two spines, of which the inner spine is very small or, in some specimens of *T. (T.) albescens*, absent.

The Nearctic species of this subgenus may be divided into three species groups. The *coracinus* group, including *coracinus* and *albescens*, has the male tarsus bearded, genitalia resembling those of the subgenus *Endochironomus*, and the size larger than in other members of the subgenus. The *obediens* group, including *obediens* and *profusus*, has the male tarsus without a beard and the styles of the male genitalia short. The *punctipes* group, including *dyari*, *flavipes*, *punctipes*, and *vittatus*, is similar to the *obediens* group but has the male style long and clavate.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS TANYTARSUS

1. Wing length 3.7 to 5.2 mm.; fore tarsus of male bearded; leg ratio 0.9 to 1.25..... 2
- Wing length 2.6 to 3.4 mm.; fore tarsus of male not bearded; leg ratio 1.1 to 1.35..... 3

2. Leg ratio 0.9 to 1.0; abdomen entirely blackish; antennal ratio of male about 4.2; wing length about 4.7 mm.75. *coracinus* (Zetterstedt).
 Leg ratio 1.15 to 1.25; abdomen usually with pale markings; antennal ratio of male about 2.3; wing length about 3.8 mm.76. *albescens*, new species
3. Abdomen mostly or entirely pale green, or in the female more or less infusate greenish 4
 Abdomen mostly or entirely blackish 5
4. Palpus and mouthparts stramineous or pale brown; legs whitish; abdominal incisures 2 to 4 not darkened in either sex81. *punctipes* (Wiedemann)
 Palpus and mouthparts dark brown; legs light brown; abdominal incisures 2 to 4 of male broadly blackish82. *vittatus*, new species
5. Style of male genitalia and terminalia of female whitish 6
 Style of male genitalia and terminalia of female dark brown 7
6. Fork of Cu practically under r-m; abdominal tergites 1 to 5 of male with lateral whitish translucent blotches79. *dyari*, new species
 Fork of Cu distinctly beyond r-m; abdominal tergites of male uniformly blackish80. *flavipes* (Meigen)
7. Abdominal tergites 2 to 4 of male blackish brown, the apical 0.2 with a cinereous bloom and the sides often inconspicuously whitish and translucent (Rocky Mountains and westward)77. *profusus*, new species
 Abdominal tergites 2 to 4 of male blackish brown with the apical 0.15 above and at least the apical 0.3 laterally conspicuously whitish and translucent (east of Rocky Mountains)78. *obediens* Johannsen

75. *Tanytarsus* (*Tanytarsus*) *coracinus* (Zetterstedt),
 new combination

Chironomus coracinus Zetterstedt, 1850, *Diptera Scandinaviae* 9:3508; type locality: Northern Jemtland, Sweden (? Lund museum).
Endochironomus coracinus Andersen, 1937, *Meddelelser om Grönländ* 116, No. 1: 31-33; description of larva, pupa, and adult.
Pentapeditum (*Sergentia*) *coracinum* Miller, 1941, *Univ. Toronto Studies* (biol. ser.) 49:40, 45, 61, 63; biology.

Male: Wing 4.7 mm. long; leg ratio 0.95; antennal ratio 4.2; hairs between median and lateral lobes of mesoscutum anteriorly in a single row, posteriorly in a triple row; fore tarsus with a long dense beard; fork of Cu beyond r-m; hairs on wing membrane sparser than in other members of the subgenus and easy to find only near the wing apex.

Black. Legs beyond coxae brown; anterior wing veins blackish; hairs on wing membrane light brown; halter blackish at base, the knob whitish.

Genitalia: Figure 75. Rather similar to those of *T. albescens* (fig. 76) and of the subgenus *Endochironomus* (fig. 69).

Female: Similar to the male except for the usual sexual differences.

This is a large black stocky species common in the far North. It superficially resembles certain boreal species of the subgenus *Tendipes*. I have not studied European material, but the specimens before me fit the descriptions by European authors very well.

Material: Male, Wabaman, Alberta, April 24, 1939, E. H. Strickland (Alta.); male, Waterton Lakes, Alberta, June 19, 1923, J. McDunnough (CNC); 4 males, 4 females, Costello Lake in Algonquin Park, Ontario, May 5 to 11, 1938, R. B. Miller

(Townes); 23 males, Many Glacier, Glacier National Park, Mont., June 2, 1926, H. G. Dyar (USNM, Townes). The above records are probably from near the southern limit of the species, as there are several published records of its occurrence in more northern Nearctic localities but none from localities farther south. It is also widespread in the arctic and subarctic regions of Europe.

76. *Tanytarsus (Tanytarsus) albescens*, new species

Male: Wing 3.8 mm. long; leg ratio 1.2; antennal ratio 2.3; hairs between median and lateral lobes of mesoscutum arranged mostly in a double row; fork of Cu very slightly beyond r-m; front tarsus with a moderately dense long beard; hind tibial combs with either one or two spines (in all other species of the subgenus there are always two spines).

Blackish brown. Wing veins and hairs light brown; legs beyond coxae stramineous to light brown; halter stramineous; basal four abdominal segments light brown with the apical half of the sides of each segment pale translucent brown, or darker brown with the pale lateral areas more or less obsolescent.

Genitalia: Figure 76. In the short broad style and long coxite, this species resembles *T. coracinus* (fig. 75) and the subgenus *Endochironomus* (fig. 69).

Female: Colored like the male except that all but the apical tergites are brown with the apical 0.25 pale brown.

Type: Male, Lake Cushman, Wash., June 27, 1917, H. G. Dyar (USNM).

Paratypes: Thirty-eight males, 11 females, from Alberta (Banff); British Columbia (Kaslo); California (Gold Lake Camp in Plumas County); Colorado (Estes Park, Grand Lake, Hayden, and Pingree Park); Idaho (Coeur d'Alene Lake and Sandpoint); Montana (Big Timber); Nevada (Reno); Utah (River Heights); Washington (Lake Cushman and South Prairie); and Wyoming (Meadow Lake in the Bighorn Mountains at 8,000 ft.). These are in the collections of Townes, United States National Museum, and Utah. Collection dates range from April 19 at River Heights, Utah, to August 23 at Estes Park, Colo.

77. *Tanytarsus (Tanytarsus) profusus*, new species

Male: Wing 3.1 mm. long; leg ratio 1.15; antennal ratio 1.9; hairs between median and lateral lobes of mesoscutum in a partially double row; fork of Cu under or very slightly beyond r-m; front tarsus not bearded.

Blackish brown. Wing veins and hairs light brown; halter whitish; legs beyond coxae stramineous; apical 0.2 of abdominal tergites 1 to 7 lighter brown, usually with a cinereous bloom, and on the sides faintly translucent; style usually lighter brown than the body.

Genitalia: Figure 77. Similar to those of *T. obediens* (fig. 78), but the style usually slightly stouter and less curved.

Female: Abdomen almost uniformly blackish brown. Otherwise similar to the male except for the usual sexual differences.

The clearest differences between this species and *T. obediens* are in the color of the male abdomen and the position of the cubital fork. Eastern and Western specimens of the two forms are constant in these respects, though collections from intermediate localities may show them to be only subspecifically distinct.

Type: Male, Reno, Nev., September 27, 1915, H. G. Dyar (USNM).

Paratypes: Three hundred and twelve males, 190 females, collected at Reno, Nev., from July 2 to October 24 in 1915 and 1916 by H. G. Dyar (USNM, Townes); also 43 males, 12 females, from California (Clio in Plumas County, Fallen Leaf at Lake Tahoe, Lake Tahoe, Palo Alto, and Truckee); Colorado (Brainerd Lake, Estes Park, Fort Collins, Grand Lake, and Hayden); Idaho (Sandpoint); Montana (Missoula); Nevada (Steamboat); New Mexico (Pecos and Santa Fe); Utah (Logan and Hopper); and Washington (Lake Cushman, Orondo, and Spokane). Paratypes are in the collections of the United States National Museum, Townes, Utah, Colorado, and Cornell. Adults have been collected at Reno, Nev., from July 2 to October 24.

78. TANYTARSUS (TANYTARSUS) OBEDIENS Johannsen

Tanytarsus obediens Johannsen, 1905, Bull. N. Y. State Mus. **86**:286; type locality: hereby selected as Ithaca, N. Y. (Johannsen collection).

Tanytarsus obediens Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:492; description.

Pentapedilum (Phaenopsectra) obediens Johannsen, 1934, Jour. N. Y. Ent. Soc. **42**:352; generic position.

Pentapedilum (Phaenopsectra) obediens Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**:18; description of larva and pupa.

Male: Wing 3.3 mm. long; leg ratio 1.25; antennal ratio 2.0; hairs between median and lateral lobes of mesoscutum in a partially double row; fork of Cu somewhat beyond r-m; front tarsus not bearded.

Blackish brown. Flagellum light brown; wing veins and hairs white or very pale brown; halter and legs except bases of coxae white; abdominal tergites 1 to 4 with approximately the apical 0.15 above and 0.3 or more laterally whitish and translucent; apical margin of tergites 5 and 6 light brown; style light or dark brown.

Genitalia: Figure 78. Similar to those of *T. profusus* (fig. 77), but the style usually slightly more slender and more strongly curved.

Female: Colored like the male except that the abdomen is blackish brown, with the apical margins of segments 1 to 7 light brown. The basal few segments are often paler brown and sometimes have small pale translucent lateral areas.

This species is very near *T. profusus*, which may be a western subspecies of *obediens*. Females of the two can not be separated with certainty. They both differ from those of *T. flavipes* and of *T. dyari* in having the terminalia brown instead of white.

Material: Many males and females from the District of Columbia (Washington); Indiana (La Fayette) Iowa (Davenport); Maine; Maryland (Beltsville, Cabin John, Chevy Chase Lake, Forest Glen, Glymont, and Plummers Island); Massachusetts (Cambridge and South Hadley); Michigan (Bay County, Chippewa County, Detroit, East Lansing, and Isabella County); Minnesota (Olmsted County); New Hampshire (Franconia); New Jersey (Clementon, Delaware Water Gap, Riverton, and Westville); New York (Canajoharie, Freeville, Gloversville, Grand Island, Herkimer, Ithaca, Kinderhook, Lancaster, McLean, Niagara Falls, North Petersburg, Oneonta, Rome, Sea Cliff, and Stillwater); Ontario (Ottawa, Point Pelee, Rockport, and Simcoe); Pennsylvania (Castle Rock, Montgomery County, Philadelphia, and Pottstown); Quebec (Hull and Ottawa Golf Club); Rhode Island (Westerly); South Carolina (Greenville); and Virginia (Falls Church, Great Falls, and Mountain Lake). Adults have been collected from April 20 to September 24 at Plummers Island, Md., and from May 14 to October 18 at South Hadley, Mass. The species seems to breed most abundantly in larger streams. There is a great flight of adults in the spring, reaching a peak around May 28 at Ithaca, N. Y., and around May 5 at Plummers Island, Md. At other seasons adults are less common.

79. *Tanytarsus* (*Tanytarsus*) *dyari*, new species

Male: Wing 3.4 mm. long; leg ratio 1.1; antennal ratio 1.85; hairs between median and lateral lobes of mesoscutum in a partially double row; fork of Cu under or very slightly beyond r-m; front tarsus not bearded.

Dark brown. Flagellum brown; wing veins and hairs light brown; halter whitish; legs except bases of coxae pale brown; abdominal tergites 1 to 5 laterally with a whitish translucent spot occupying the apical 0.3 of each; apical margin of segments 5 and 6 whitish; style and apical part of inferior appendage whitish.

Genitalia: Figure 79, drawn from the type. Similar to those of *T. flavipes* (fig. 80) but the inferior appendage narrower and with fewer hairs.

Female: Abdomen uniformly blackish brown with the apical margins of tergites 1 to 6 pale brown and the terminalia whitish. Otherwise similar to the male except for the usual sexual differences.

This species is near *T. flavipes*, but is larger, darker, has the cubital fork under r-m, and has lateral pale spots on the male abdomen as in *T. obediens*.

Type: Male, Lake Tahoe, Calif., June 13, 1916, H. G. Dyar (USNM).

Paratypes: Male, female, Fallen Leaf at Lake Tahoe, Calif., June 19, 1916, H. G. Dyar (USNM, Townes); female, Fieldbrook, Calif., May 29, 1903, H. S. Barber (USNM); male collected with the type (USNM); male, Missoula River at Missoula, Mont., July 1, 1940, H. and M. Townes (Townes).

80. TANYTARSUS (TANYTARSUS) FLAVIPES (Meigen)

Chironomus flavipes Meigen, 1818, Syst. Besch. europ. zweifl. Ins. 1:50; type locality: ?France (?Paris museum).

Tanytarsus flavipes Wulp, 1873, Tijdschr. voor Ent. 17: 134; generic position.

Tanytarsus flavicauda Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:493; type locality: Carbondale, Ill. (Ill.). New synonymy.

Pentapedium (*Phaenopsectra*) *flavicauda* Johannsen, 1934, Jour. N. Y. Ent. Soc. 42: 352; generic position.

Male: Wing 2.9 mm. long; leg ratio 1.25; antennal ratio 1.25; hairs between median and lateral lobes of mesoscutum in a partially double row; fork of Cu somewhat beyond r-m; fore tarsus not bearded.

Blackish brown. Flagellum and mouthparts pale brown; wing veins and wing hairs pale brown to whitish; halter white; legs except bases of coxae stramineous to whitish; style and apical part of inferior appendage whitish.

Genitalia: Figure 80. The style is unusually slender for the subgenus.

Female: Similar to the male except for the usual sexual differences. The terminalia are whitish.

I have compared Nearctic material with a series of six males from England, determined by Edwards.

Material: Many males and females from California (Blue Lake in Humboldt County); Colorado (Hayden); Connecticut (New Haven); Idaho (Sandpoint); Iowa (Davenport); Massachusetts (Amherst and South Hadley); Michigan (East Lansing and Midland County); Montana (Missoula); New Jersey (Riverside); New York (Bemus Point, Canajoharie, Gloversville, Ithaca, Kinderhook, Newport, Otsego Lake, Syracuse, and Valley Falls); Ontario (Costello Lake in Algonquin Park, Kearney, and Ottawa); Oregon (Takenitch Lake); Quebec (Aylmer and Hull); South Carolina (Greenville); Texas (Dallas); Washington (Lake Cushman and Mt. Rainier at 4,200 ft.); and Virginia (Dead Run in Fairfax County). Collection dates range from April 2 at Dallas, Tex. and May 8 at Syracuse, N. Y., to October 18 at South Hadley, Mass. The species is widespread in Europe, and Edwards has reported it from Chile.

81. TANYTARSUS (TANYTARSUS) PUNCTIPES (Wiedemann)

Chironomus punctipes Wiedemann, 1817, Zool. Mag. 1: 65; type locality: Kiel, Denmark (location of type unknown).

Tanytarsus punctipes Wulp, 1873, Tijdschr. voor Ent. 17:134; generic position.

Male: Wing 2.7 mm. long; leg ratio 1.3; antennal ratio 1.9; hairs between median and lateral lobes of mesoscutum arranged in a single row; fork of Cu somewhat beyond r-m; front tarsus not bearded.

Polished black. Mouthparts pale brown to whitish; wing veins and hairs pale brown to white; halter and legs except bases of coxae whitish; abdomen pale green.

Genitalia: Figure 81. The superior appendage is longer and more strongly hooked toward its tip and the style more slender than is usual for the subgenus.

Female: Green color of the abdomen more or less darkened by infuscation. Otherwise similar to the male except for the usual sexual differences.

I have compared Nearctic material with a male from England, determined by Edwards.

Material: Many males and females from Idaho (Cataldo and Coeur d'Alene Lake); New Jersey (Riverton); New York (Canadarago Lake, Hudson, Niskayuna, and Otsego Lake); Quebec (Beloil); and South Carolina (Greenville). These specimens were all collected around the edges of lakes or on the banks of slow rivers. Collection dates range from June 11 at Beloil, Quebec, to September 3 at Otsego Lake, N. Y. The species is widespread in Europe.

82. *Tanytarsus* (*Tanytarsus*) *vittatus*, new species

Male: Wing 2.6 mm. long; leg ratio 1.24; antennal ratio 2.2; hairs between median and lateral lobes of mesoscutum arranged in a single row; fork of Cu somewhat beyond r-m; front tarsus not bearded.

Polished black. Flagellum and mouthparts brown; wing veins and hairs light brown; legs stramineous brown; halter whitish; abdomen pale green, the second to fourth incisures black, the fifth incisure dusky, and everything beyond the sixth segment except the style and apical part of the inferior appendage blackish brown.

Genitalia: Figure 82, drawn from the type. The style is somewhat more clavate than usual for the subgenus.

Female: Abdomen uniformly pale green, somewhat darkened by infuscation. Otherwise similar to the male except for the usual sexual differences.

Type: Male, where Clark Brook crosses United States Route 206, Atsion, N. J., June 3, 1939, H. K. Townes (Townes).

Paratypes: Male, collected with the type (Townes); male, female, collected at the type locality, June 25, 1939, H. K. Townes (Townes); female, collected at the type locality, July 30, 1939, H. K. Townes (Townes); male, Ottawa, Ontario, July 31, 1924, C. H. Curran (USNM); male, Ottawa, Ontario, August 18, 1924, G. S. Walley (CNC); 2 males, Hull, Quebec, August 12 and 13, 1924, C. H. Curran (CNC, USNM); male, Kirk's Ferry, Quebec, August 4, 1925, C. H. Curran (CNC).

Subgenus STICTOCHIRONOMUS

Stictochironomus Kieffer, 1919, Ent. Mitteil. 8:44. Genotype: *Chironomus pictulus* Meigen (by present designation).

Female flagellum with 5 segments; wing membrane without macrotrichia; fork of Cu basad of to slightly beyond r-m; ends of R_1 and R_{2+3} widely separated; combs of middle and hind tibiae fused to well separated, each pair with a single spine (fig. 256); mesoscutum with a distinct tubercle at the posterior end of the median vitta.

The species *palliatu*s, *albicus*, *devinctu*s, *naevu*s, and *unguiculatu*s are easy to distinguish, but the others which have formerly been confused under the name *flavicingula* (Walker), are very similar to one another and specific limits are hard to find. An attempt is made here to distinguish a number of these species, but clarification of specific limits and description of additional species will have to wait for the accumulation of more material.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS STICTOCHIRONOMUS

1. Wing without a dark spot over r-m; hind tibia without a dark annulus at its middle 2
 Wing with a dark spot over r-m; hind tibia with a dark annulus at its middle, or entirely dark brown 4
2. Abdominal tergites 1 to 4 uniformly dark; mesoscutum red-brown 83. *palliatu*s (Coquillett)
 Abdominal tergites 1 to 4 with the apical part pale with a cinereous bloom; mesoscutum blackish gray 3
3. Middle and hind tibiae entirely white 84. *albicus*, new species
 Middle and hind tibiae black at base and apex 85. *devinctu*s (Say)
4. Tibiae uniformly dark brown 90. *unguiculatu*s (Malloch).
 Tibiae banded with dark brown and white or whitish 5
5. Wing with definite (though often faint) grayish spots 6
 Wing without definite spots besides the spot over r-m 8
6. Wing with a definite dark spot in the middle of cell R_5 (fig. 216)
 Wing without a spot in the middle of cell R_5 (fig. 217) 86. *naevu*s (Mitchell) 7
7. Middle tibia without a central dark annulus; mesoscutum pale gray, with a few hairs on its disc just behind the central tubercle 87. *marmoreu*s, new species
 Middle tibia with a central dark annulus; mesoscutum blackish gray, without hairs on its disc behind the central tubercle 88. *quaega*, new species
8. Halter knob fuscous; row of hairs between median and lateral lobes of mesoscutum containing 16 to 35 hairs; antennal ratio 3.6 to 4.2; fore tarsus of male with a long beard 89. *variu*s, new species
 Halter knob white; row of hairs between median and lateral lobes of mesoscutum containing 13 to 20 hairs; antennal ratio 1.8 to 3.3; fore tarsus of male with a short beard or without a beard 9
9. Front tarsus of male with a short beard; antennal ratio about 3.2; leg ratio 1.02 to 1.12 91. *annulicru*s, new species
 Front tarsus of male without a beard; antennal ratio 1.8 to 2.5; leg ratio 0.95 to 1.03 10
10. Fork of Cu even with or slightly distad of the point where r-m joins M; middle tibia with a dark annulus at the middle 92. *lutosu*s, new species
 Fork of Cu more or less distinctly basad of the point where r-m joins M; middle tibia without an annulus at the middle or with a very faint one 93. *virgatu*s, new species

83. *Tanytarsus* (*Stictochironomus*) *palliatu*s (Coquillett),
 new combination

- Chironomus palliatu*s Coquillett, 1902, Proc. U. S. Nat. Mus. 25: 95; type locality: Washington, D. C. (USNM).
*Chironomus palliatu*s Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:441; description of larva, pupa, and adult.
*Chironomus palliatu*s Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:412; biology.

Polypedilum palliatus Lenz, 1921, Deut. Ent. Ztschr., p. 162; generic position.
Chironomus (Polypedilum) palliatus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:33; generic position.

Male: Wing 2.7 mm. long; leg ratio 1.4; antennal ratio 2.6; hairs between median and lateral lobes of mesoscutum in a partially double row, about 21 in number; fork of Cu slightly distad of r-m; front tarsus with a very short beard, or none.

Dark brown, the head, mesoscutum, and scutellum red-brown. Wing and wing veins pale, the wing membrane with extensive very faint gray markings along the veins; halter knob dark brown; flagellum and genitalia stramineous; legs stramineous with the coxae, trochanters, basal 0.6 more or less of femora, and all except basal 0.3 of middle tibia brown, the brown markings not sharply defined.

Genitalia: Figure 83. Easily distinguished from all others of its subgenus by its large style.

Female: Similar to the male except for the usual sexual differences.

This species has an unspecialized color pattern, genitalia, and venation. It seems to be the most primitive of its subgenus.

Material: Many males and females from Alabama (Leroy); District of Columbia (Washington); Illinois (Thompson's Lake near Havana); Iowa (Davenport); Maryland (Forest Glen, Great Falls, and Plummers Island); Mississippi (Westpoint); New York; Oklahoma (Holdenville); Texas (Brazos River at Richmond); and "Sharon Springs" (Kansas? New York?). Adults have been collected from May 12 near Havana, Ill., to August 26 at Plummers Island, Md.

84. *Tanytarsus (Stictochironomus) albicrus*, new species

Male: Unknown.

Female: Wing 4.0 mm. long; leg ratio 1.14; hairs between median and lateral lobes of mesoscutum in a single row except that about four of them just behind the central tubercle are displaced toward the center, the hairs about 19 in number; fork of Cu under the distal end of r-m.

Colored like *T. annulicrus* (see below) except that vein r-m is not covered by a blackish spot and that the tibiae and tarsi are entirely white.

Type: Female, Douglas County, Kans., September 10, 1937, F. C. Lawrence (Kans.).

85. *Tanytarsus (Stictochironomus) devinctus* (Say), new combination

Chironomus devinctus Say, 1829, Jour. Acad. Nat. Sci. Phila. 6:150 (Leconte Ed. 2: 349); type locality: Indiana (type lost).

Chironomus devinctus Johannsen, 1905, Bull. N. Y. State Mus. 86:216; description.

Chironomus compe Coquillett, 1908, Proc. Ent. Soc. Wash. 9:145; type locality: Plummers Island, Md. (USNM).

- Chironomus devinctus* Johannsen, 1908, Bull. N. Y. State Mus. **124**:279; descriptive note.
Chironomus devinctus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:433; description, synonymy.
Chironomus ornatipes Keiffer, 1917, Ann. Mus. Nat. Hung. **15**:343; type locality: Long Lake, Adirondak Mountains, N. Y. (Nat. Mus. Hungary). New synonymy.
Chironomus (Stictochironomus) devinctus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**:30; generic position.
Chironomus (Polypedilum) devinctus Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 4; generic position.
Chironomus (Stictochironomus) devinctus Miller, 1941, Univ. Toronto Studies (biol. ser.) **49**: 44, 47, 49, 61, 62; biology.

Male: Wing 3.3 mm. long; leg ratio 1.35; antennal ratio 2.6; hairs between median and lateral lobes of mesoscutum in a single row, about 14 in number; fork of Cu under or slightly beyond r-m; fore tarsus without a beard.

Colored as in *T. annulicrus* (see below) except that the wing and wing veins are entirely pale and that the middle and hind tibiae always lack the central dark annulus.

Genitalia: Similar to those of *T. marmoreus* (fig. 87).

Female: Similar to the male except for the usual sexual differences.

Professor O. A. Johannsen has examined the type of *C. ornatipes* Kieffer in Budapest and informs me that it is a typical specimen of the present species.

Material: Many males and females from Illinois (Centerville, Chicago, Muncie, Quiver Lake, and Urbana); Iowa (Davenport); Maine (Echo Lake on Mt. Desert Island); Maryland (Glymont and Plummers Island); Michigan (Brevort, Iosco County, Manistee, Midland County, and Nottawa); Minnesota (Cass Lake); North Carolina (Raleigh); New Hampshire (Center Harbor); New Jersey (Westville); New York (Chautauqua Lake, Croton Reservoir, Glenida Lake, Ithaca, Kensico Reservoir, Muscoot Reservoir, Old Forge, Otsego Lake, and Sport Island in the Sacandaga River); Ontario (Point Pelee, Prescott, and Smoky Falls in the Mattagami River); Quebec (Aylmer, Coteau du Lac, and Lachine); Texas (Jefferson); and Virginia (Dead Run in Fairfax County). Adults have been collected from March 27 at Jefferson, Texas, and May 8 to September 3 at Plummers Island, Md. The species is widespread, but I have never seen it very common.

86. *Tanytarsus (Stictochironomus) naevus* (Mitchell), new combination

- Chironomus naevus* Mitchell, 1908, Jour. N. Y. Ent. Soc. **16**:14; type locality: Beulah, N. Mex., at 8,000 feet (USNM).
Chironomus naevus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:433; description.

Male: Wing 4.3 mm. long; leg ratio 1.15; antennal ratio ?; hairs between median and lateral lobes of mesoscutum in a single row that is somewhat double posteriorly, the hairs about 20 in number; fork of Cu distinctly basad of r-m; fore tarsus, with a short indistinct beard.

Colored as in *T. annulicrus* except that all three tibiae have a central dark annulus and the wing has conspicuous fuscous spots as in figure 216. (Fig. 216 is of a female wing.)

Genitalia: The genitalia of the type have not been put on a microscope slide. They are apparently similar to those of *T. marmoreus* (fig. 87).

Female: Similar to the male except for the usual sexual differences.

Material: Besides the type male from Beulah, N. Mex., I have studied 3 females from Torrence County, N. Mex., collected in July 1925, by C. H. Martin (Kans., Townes).

87. *Tanytarsus* (*Stictochironomus*) *marmoreus*, new species

Male: Wing 3.3 mm. long; leg ratio 1.2; antennal ratio 2.4; about 21 hairs in the hair row between the median and lateral lobes of the mesoscutum, of which about 4 just behind the central tubercle are displaced toward the center, the rest being in a single line; fork of Cu distinctly basad of r-m; fore tarsus with a very short beard.

Colored like *T. annulicrus* (see below) except that the body (especially the thorax) is a paler more pruinose gray, the wing is marked with pale-gray spots as in figure 217, the middle tibia always lacks the central dark annulus, and the femora basad of the subapical white annulus are pale brown or stramineous instead of blackish brown. Usually the femora have a broad indefinite darker brown annulus centering just beyond the middle.

Genitalia: Figure 87. Essentially similar to those of all other members of the subgenus except *T. palliatus*. Although there seem to be some slight genitalic differences between the species of *Stictochironomus*, these are not great or constant enough to give good taxonomic characters.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Saskatoon, Saskatchewan, August 11, 1918, H. G. Dyar (USNM).

Paratypes: Five males, 22 females, Atherton, Mo., April 17, 1916, April, May, June, July, and September, C. F. Adams (Johannsen, Townes); male, Buffalo, N. Y., September 11, 1910, M. C. VanDuzee (Calif. Acad.); 13 males collected with type (USNM, Townes); 2 males, 2 females, Pierre, S. Dak., May 23, 1930, J. M. Aldrich (USNM, Townes).

88. *Tanytarsus* (*Stictochironomus*) *quagga*, new species

Male: Wing 3.9 mm. long; leg ratio 1.1; antennal ratio 2.2; hairs between median and lateral lobes of mesoscutum in a single line, about 15 in number; fork of Cu distinctly basad of r-m; fore tarsus without a beard.

Colored like *T. annulicrus* (see below) except that the wing is marked with pale gray spots similar to those of *T. marmoreus* (fig. 217) but slightly less conspicuous, and that all the tibiae have a central dark annulus. The central dark annulus on the front tibia is often faint.

Genitalia: Similar to those of *T. marmoreus* (fig. 87).

Female: Similar to the male except for the usual sexual differences.

This species is near the European *pictulus* (Meigen), of which I have seen specimens in the United States National Museum, determined by Edwards. *T. pictulus* differs in having a faint spot in the middle of cell R_5 .

Type: Male, Fallen Leaf, Lake Tahoe, Calif., June 17, 1916, H. G. Dyar (USNM).

Paratypes: Six males, 1 female, Fallen Leaf, Lake Tahoe, Calif., June 13, 17, 18, and 19, 1916, H. G. Dyar (USNM, Townes); 2 males, Truckee, Calif., July 16, 1916, H. G. Dyar (USNM, Townes).

89 *Tanytarsus* (*Stictochironomus*) *varius*, new species

Male: Wing 4.3 mm. long; leg ratio 1.0; antennal ratio 3.8; about 25 hairs in the hair row between the median and lateral lobes of the mesoscutum, those in the posterior third of the row in an irregularly double line, the rest in a single line; fork of Cu distinctly basad of r-m; fore tarsus with a long, moderately dense beard.

Colored like *T. annulicrus* (see below) except that the halter knob is fuscous and the middle tibia lacks the central dark annulus. Occasional specimens have a faint central dark annulus on the middle tibia.

Genitalia: Similar to those of *T. marmoreus* (fig. 87).

Female: Similar to the male except for the usual sexual differences.

Type: Male, Six Mile Creek above the upper reservoir at Ithaca, N. Y., May 12, 1940, H. and M. Townes (Townes).

Paratypes: Two males, campus of the University of Colorado, Boulder, Colo., September 13, 1917, Ackerman (USNM); 4 males, Ames, Iowa, May 21, 1928, G. S. Walley (CNC); male, female, Lawrence, Kans. (USNM); male, Detroit, Mich., May 5, 1939, G. Steyskal (Sabrosky); 3 males, 2 females, East Lansing, Mich., May 4, 1936, September 13, 1939, September 23, 1939, and September 27, 1939, C. W. Sabrosky (Sabrosky); male, Hennepin County, Minn., May 2, 1936, C. E. Mickel (Minn.); 11 males, 1 female, collected at the type locality, May 5, 1940, H. and M. Townes (Townes); 10 males, 3 females, collected with the type (Townes); male, Ithaca, N. Y., May 14, 1940, H. and M. Townes (Townes); 2 males, Ithaca, N. Y., May 5, 1936, H. K. Townes (Townes).

90. *Tanytarsus* (*Stictochironomus*) *unguiculatus* (Malloch), new combination

Chironomus (*Chironomus*) *unguiculatus* Malloch, 1934, Mem. Carnegie Mus. 12, pt. 2, sect. 4: 16; type locality: Southampton Island, Keewatin, Northwest Territories (Carnegie Museum).

Male: Wing 4.1 mm. long; leg ratio 0.95; antennal ratio 4.3; about 20

hairs between the median and lateral lobes of the mesoscutum; fork of Cu distinctly basad of r-m; fore tarsus with a long rather dense beard.

Black. Legs blackish brown; anterior wing veins light brown, vein r-m brown with the surrounding wing membrane faintly tinged with brown; posterior wing veins almost colorless; halter entirely brown; apical 0.18 of abdominal tergites with a cinereous pruinescence.

Genitalia: Rather similar to those of *T. marmoreus* (fig. 87).

Female: Unknown.

Material: Male (type), Southampton Island, Keewatin, Northwest Territories, 1930, G. M. Sutton (Carnegie Museum). Redescribed from the type.

91. *Tanytarsus* (*Stictochironomus*) *annulicrus*, new species

Male: Wing 4.2 mm. long; leg ratio 1.07; antennal ratio 3.2; hairs between median and lateral lobes of mesoscutum in a single line, about 17 in number; fork of Cu distinctly basad of r-m; front tarsus with a short beard.

Blackish brown with a strong gray pruinescence, especially on the thorax. Wing with a blackish spot on r-m, with the surrounding membrane infusate, and with very pale gray markings along the veins; anterior wing veins brownish; halter knob white; legs white, marked with blackish brown as follows: Coxae, femora except a subapical annulus, the extreme basal part of the middle and hind femora, and the basal 0.3 of fore femur; basal 0.3 and apical 0.1 of fore tibia; basal and apical 0.1 and central 0.2 of middle tibia (the central dark annulus sometimes wanting); basal and apical 0.1 and central 0.33 of hind tibia; apices of tarsal segments 1 to 3; and all of tarsal segments 4 and 5. The trochanters and basal pale parts of femora are not white but a pale brown. Apical $0.3 \pm$ of abdominal tergites 1 to 6 and the apical margin of tergite 7 pruinose white.

Genitalia: Similar to those of *T. marmoreus* (fig. 87).

Female: Unknown.

Type: Male, Syracuse, N. Y., May 8, 1938, H. and M. Townes (Townes).

Paratypes: Two males, collected with the type (Townes); male, Ithaca, N. Y., May 12, 1940, H. and M. Townes (Townes); 3 males, McLean Reserve, Courtland County, N. Y., August 29, 1925, August 30, 1925, and September 3, 1925 (Cornell, Rempel); and male, Simcoe, Ontario, May 28, 1939, G. E. Shewell (CNC).

92. *Tanytarsus* (*Stictochironomus*) *lutosus*, new species

Male: Wing 3.3 mm. long; leg ratio 1.0; antennal ratio 2.2; hairs between median and lateral lobes of mesoscutum in a single row, about 15 in number; fork of Cu under the basal end of r-m; fore tarsus without a beard.

Colored as in *T. annulicrus* (see above) except that the ground color of the legs is light brown rather than white, and the central dark annulus is always present on the middle tibia and is broader on both the middle and hind tibiae than in *T. annulicrus*. There is often a more or less distinct central dark annulus on the fore tibia.

Genitalia: Similar to those of *T. marmoreus* (fig. 87).

Female: Similar to the male except for the usual sexual differences.

Type: Male, South Hadley, Mass., April 30, 1936, M. C. Townes (Townes).

Paratypes: Two males, 1 female, collected with the type (Townes); 2 males, 2 females, South Hadley, Mass., May 6, 1936, M. C. Townes (Townes); male, South Hadley, Mass., May 15, 1936, M. C. Townes (Townes).

93. *Tanytarsus* (*Stictochironomus*) *virgatus*, new species

Male: Wing 3.7 mm. long; leg ratio 1.02; antennal ratio 1.95; hairs between median and lateral lobes of mesoscutum in a single row, about 16 in number; fork of Cu distinctly basad of r-m; fore tarsus without a beard.

Colored as in *T. annulicrus* (see above) except that the middle tibia always lacks the central dark annulus.

Genitalia: Similar to those of *T. marmoreus* (fig. 87).

Female: Similar to the male except for the usual sexual differences.

Type: Male, Missoula, Mont., July 6, 1917, H. G. Dyar (USNM).

Paratypes: Twenty-three males, 1 female, collected with the type (USNM, Townes).

Genus *STENOCHIRONOMUS*

Stenochironomus Kieffer, 1919, Ent. Mitteil. 8:44. Genotype: *Chironomus pulchripennis* Coquillett (by present designation).

Palpus with 4 segments; male flagellum with 13, female with 5 segments; antennal ratio 0.9 to 2.5; frontal tubercles absent; pronotum very narrow medially, far surpassed by the strongly projecting anterior part of the mesoscutum (fig. 231); squamal fringe present; wing membrane without macrotrichia; fork of Cu slightly beyond r-m; ends of R_1 and R_{2+3} very near together, almost fused; ends of R_{4+5} and M both near the wing apex, R_{4+5} usually slightly nearer than M; leg ratio 1.1 to 1.5; tarsal beard absent; fore tibia with an inner apical triangular scale with a rounded end, the scale about 0.6 as long as the tibial diameter; combs of middle and hind tibiae fused, each pair with two short spines; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present; superior appendage small, spatulate, and with several bristles; inferior appendage very long, narrow, and curved, usually compressed and with very few apical bristles. See figures 96 to 103.

KEY TO THE NEARCTIC SPECIES OF STENOCHIRONOMUS

1. Wing without definite transverse central and apical dusky bands 2
 Wing with definite transverse central and apical dusky bands 6
2. Legs and abdominal tergites 2 and 3 marked with brown; wing veins and central part of wing dusky (fig. 218) 3
 Legs and abdominal tergites 2 and 3 entirely pale 5
3. Abdominal tergites 2 and 3 almost entirely brown; mesoscutum and mesosternum dark brown; antennal ratio of male about 1.35 94. *browni*, new species
 Abdominal tergites 2 and 3 greenish with not more than the apical 0.3 brown; mesoscutum and mesosternum light brown; antennal ratio of male 1.45 to 1.75 4
4. Apical 0.3 of hind tibia stramineous, distinctly paler than the rest of the tibia; apical 0.3 of abdominal tergites 2 and 3 brown; tergite 4 without brown on its apex or with a very narrow and indistinct brownish band; antennal ratio of male about 1.50 95. *aestivalis*, new species
 Apical 0.3 of hind tibia brown, concolorous with the rest of the tibia; apical 0.2 of abdominal tergites 2 and 3 brown; tergite 4 with the apical 0.12 brown; antennal ratio of male about 1.67 96. *cinctus*, new species
5. Wing with a dusky streak along vein Cu_2 (fig. 222); wing about 3.4 long 100. *unicus*, new species
 Wing without a dusky streak along vein Cu_2 ; wing about 2.6 mm. long 101. *macatei* (Malloch)
6. Apical wing band small, not entering cell Cu_1 (figs. 219 to 221B) 7
 Apical wing band large, covering apical part of cell Cu_1 (figs. 223 and 224) 9
7. Fore femur brown, usually with a subapical pale annulus; median lobe of mesoscutum with a centrally located pair of small brown spots 97. *poecilopterus* (Mitchell)
 Fore femur whitish with apical 0.2 or less brown; median lobe of mesoscutum without brown spots 8
8. Basal 0.3 or more of hind tibia of male brown; basal part of wing of female dusky between veins C and R (fig. 220B); dark markings of wings and legs more extensive than in *S. colei* 98. *pulchripennis* (Coquillett)
 Basal 0.15 or less of hind tibia of male pale brown; basal part of wing of female hyaline between veins C and R (fig. 221B); dark markings of wings and legs less extensive than in *S. pulchripennis* 99. *colei* (Malloch)
9. Apical part of fore tibia brown, usual (always in the female) the entire tibia brown; basal part of wing of male dusky between veins C and R (fig. 223) 102. *hilaris* (Walker)
 Apical part of fore tibia whitish; basal part of wing of male hyaline between veins C and R (fig. 224) 103. *taeniapennis* (Coquillett)

The species *browni*, *aestivalis*, *cinctus*, and the West Indian *leptopus*⁹ form a closely related group distinguished by a characteristic color pattern, size, and constant relatively primitive genitalia. These may be known as the *cinctus* group. The species differ among themselves only in the antennal ratio of the male and in details of coloration. The species *poecilopterus*, *pulchripennis*, and *colei* form a closely related group with a characteristic wing pattern and rather distinctive genitalia. The species *hilaris* and *taeniapennis* are very close to each other in color and in genitalia. *S. mucatei* and *S. unicus* are somewhat intermediate between the *pulchripennis* and the *hilaris* groups.

⁹ *Stenochironomus leptopus* (Kieffer) is a new combination. It was described from St. Vincent in the West Indies as *Chironomus longimanus* by Williston in 1896. Since *longimanus* was preoccupied, it was renamed *leptopus* by Kieffer in 1906. A cotype male in the American Museum has an antennal ratio of 0.95.

94. *Stenochironomus browni*, new species

Male: Wing 2.2 mm. long; leg ratio 1.3; antennal ratio 1.35.

Dark brown. Flagellum, legs, and mouthparts somewhat paler brown than the body, the femora with an indistinct subapical pale annulus; wing veins dark brown; central 0.5 of wing covered by an indistinct brownish cloud (fig. 218); halter pale brown; abdomen dark brown, marked with stramineous or greenish white as follows: All of segment 1, basal 0.2 of segment 2, and basal 0.8 of segments 4 and 5; basal 0.3 of segment 3 usually paler brown than the rest. The color pattern of this species is essentially like those of *S. cinctus* and of *S. aestivalis* but in these species the dark markings are paler and less extensive.

Genitalia: Similar to those of *S. cinctus* (fig. 96).

Female: Abdomen greenish white, marked with brown as follows: Apical 0.7 to 0.9 of tergites 2 and 3, genital sternite, and indistinct variable markings on the apical segments. Otherwise similar to the male except for the usual sexual differences.

Type: Male, Canoe Creek, 12 miles south of St. Cloud on Vermont Avenue, Osceola County, Fla., April 4, 1940, S. M. Brown, Jr. (Townes).

Paratypes: Twelve males, 9 females, collected with the type (Townes).

95. *Stenochironomus aestivalis*, new species

Male: Wing 2.1 mm. long; leg ratio 1.44; antennal ratio 1.50.

Light green. Flagellum beyond the first segment pale brown; thoracic sclerites pale brown more or less marked with brown, most conspicuously brown along the lateral edge of the lateral lobe of the mesoscutum and on the post-notum; wing with a large poorly defined brown cloud across its center (as in *S. browni*, fig. 218); wing veins brown; halter greenish white; legs stramineous, indistinctly marked with brown as follows: Apical 0.12 of femora, basal 0.7 of hind tibia, fifth tarsal segments, and apices of the first to fourth segments of the fore tarsus; central part of hind femur suffused with brown; abdomen with a transverse dark-brown band occupying the apical 0.3 of tergites 2 and 3 (In the only male before me the incisure between the fourth and fifth tergites is brownish. This may be due to discoloration.); apical abdominal segments (those of type mounted on slide) probably marked as in *S. cinctus* (see below); genitalia brown.

Genitalia: Similar to those of *S. cinctus* (fig. 96).

Female: Brown markings heavier and better defined than in the male; abdomen beyond the third segment green with the genital sternite brown. Otherwise similar to the male except for the usual sexual differences.

Type: Male, where Clark Brook crosses United States Route 206, Atsion, N. J., June 17, 1939, H. K. Townes (Townes).

Paratypes: Four females collected at the type locality, June 3, 1939, and June 25, 1939 (Townes); female, Kinderhook Creek at Kinderhook, N. Y., August 31, 1934, H. K. Townes (Townes).

96. *Stenochironomus cinctus*, new species

Male: Wing 2.2 mm. long; leg ratio ? (types lack fore tarsi); antennal ratio 1.67.

Light green. Flagellum beyond first segment pale brown; thoracic sclerites very pale brown; lateral lobe of mesoscutum pale brown; apical 0.6 of postnotum light brown; wing with a large poorly defined faint-brown cloud across its center (as in *S. browni*, fig. 218); wing veins brown; halter greenish white; legs greenish stramineous with the apical 0.1 of femora, basal 0.1 of middle tibiae, all of front and hind tibiae, and fifth tarsal segments (fore tarsi lacking in types) light brown; abdomen with a transverse dark-brown band occupying the apical 0.2 of tergites 2 and 3 and the apical 0.12 of tergite 4; apical abdominal segments suffused with brown, the sixth and seventh segments with extensive subcutaneous black blotches; genitalia brown.

Genitalia: Figure 96. *S. asetivalis* and *S. browni* have similar genitalia. The moderate elongation of the style and inferior appendage and the many bristles on the latter are characters distinguishing this group of species.

Female: Unknown.

Type: Male, Canoe Creek 12 miles south of St. Cloud on Vermont Avenue, Osceola County, Fla., April 4, 1940, S. M. Brown, Jr. (Townes).

Paratypes: Male collected with the type (Townes); male, Westerly, R. I., July 1, 1935, M. C. Townes (Townes).

97. *STENOCHIRONOMUS POECILOPTERUS* (Mitchell)

Chironomus poecilopectus Mitchell, 1908, Jour. N. Y. Ent. Soc. 16:10; type locality: Cabin John, Md. (USNM); description of adult and of egg mass.

Chironomus pulchripennis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:429; description, misdetermination of *pulchripennis* (Coq.).

Chironomus (*Stenochironomus*) *poecilopectus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:28; generic position.

Male: Wing 2.9 mm. long; leg ratio 1.18; antennal ratio 2.15.

Pale green. Mouthparts and flagellum beyond the first segment brown; lateral lobe of mesoscutum with a brown stripe in front of wing base; median lobe of mesoscutum with a pair of oval brown spots near its center; postnotum marked with brown; wing with dusky bands as in figure 219; femora brown except usually for a subapical pale annulus; basal half, more or less, of tibiae brown except at the extreme base; abdominal segments, at least the apical ones, with subcutaneous black blotches which are usually concentrated at the incisions, giving the abdomen a banded appearance; genitalia mostly brown.

Genitalia: Figure 97. Similar to those of *S. pulchripennis* (fig. 98) except that the style is slightly shorter and broader.

Female: Wing markings somewhat darker and more extensive than in the male. Otherwise similar to the male except for the usual sexual differences.

Material: Many males and females from Arkansas (Little River); Colorado (Hayden); Illinois (Algonquin); Maryland (Cabin John, Glen Echo, and Plummers Island); New Jersey (Delaware Water Gap); New York (Gloversville, Ithaca, and Tuxedo); North Carolina; Pennsylvania (Pottstown); and South Carolina (Green-ville). Adults have been collected at Plummers Island, Md., from April 25 to September 24.

98. *STENOCHIRONOMUS PULCHRIENNIS* (Coquillett)

Chironomus pulchripennis Coquillett, 1902, Proc. U. S. Nat. Mus. 25:94; type locality: Franconia, N. H. (USNM).

Chironomus pulchripennis Kieffer, 1917, Ann. Mus. Nat. Hung. 15:342; description. *Stenochironomus pulchripennis* Kieffer, 1919, Ent. Mitteil. 8:44; generic position.

Male: Wing 3.0 mm. long; leg ratio 1.18; antennal ratio 2.1.

Pale green. Flagellum beyond the first segment and mouthparts brown; lateral lobe of mesoscutum with a brown stripe in front of the wing base; postnotum mostly brown; wing marked with gray as in figure 220A; apical 0.2 of femora and basal 0.2 to 0.5 of tibiae brown, the brown most extensive on the hind tibia; apical abdominal segments with the usual subcutaneous black blotches; genitalia largely brown.

Genitalia: Figure 98. The style is somewhat longer and more slender than that of *S. poecilopterus* (fig. 97) and slightly less clavate than that of *S. colei* (fig. 99).

Female: Colored like the male except the wing markings are more extensive and darker (fig. 220B) and the middle and hind femora have the apical 0.5 to 0.7 brown.

Material: Many males and females from New Jersey (Delaware Water Gap); New York (Chatham Center, Gloversville, Hagaman, Hyde Park, Lexington, Middle-ville, North Hoosick, North Petersburg, Salisbury Center, and West Galway); Ontario (Ottawa); Pennsylvania (Natrona); and Quebec (Aylmer, Hull, and Ottawa Golf Club). Adults are locally common along the banks of streams and rivers in the Northeast. They have been collected from June 18 at Ottawa, Ontario, to September 11 at North Hoosick, N. Y.

99. *Stenochironomus colei* (Malloch), new combination

Chironomus colei Malloch, 1919, Proc. Calif. Acad. Sci. 9:255; type locality: Forest Grove, Oreg. (location of type unknown; the paratype is in the Illinois collection).

Male: Wing 3.3 mm. long; leg ratio 1.15; antennal ratio 2.1.

Stramineous tinged with pale green, the sclerites of the head and thorax pale brown. Flagellum beyond the first segment and mouthparts brown; lateral lobe of mesoscutum with a light-brown stripe in front of wing base; postnotum mostly brown; wing marked with pale fuscous as in figure 221A; apical 0.12 of femora and basal 0.15 of fore tibia brown; basal 0.1 of middle and hind tibiae pale brown; apical abdominal segments with the usual subcutaneous black blotches; genitalia brownish stramineous.

Genitalia: Figure 99. Similar to those of *S. pulchripennis* (fig. 98) but with the superior appendage slightly smaller and the style more clavate.

Female: Colored like the male except that the wing markings are darker and more extensive (fig. 221B) and the front and hind tibiae have the basal 0.25 brown.

This is a pale western counterpart of *S. pulchripennis*. Material from intermediate localities may show it to be only subspecifically distinct.

Material: Two males, banks of Smith River at Crescent City, Calif., August 5, 1940, H. K. Townes (Townes); female, Hayden, Colo., August 23, 1940, H. K. Townes (Townes); 3 males, 1 female, banks of Missoula River at Missoula, Mont., July 1, 1940, H. K. Townes (Townes); male at light, Forest Grove, Oreg., June 3, 1918, F. R. Cole (Ill., paratype); 3 males, 6 females, banks of Columbia River at Orondo, Wash., July 2, 1940, H. K. Townes (Townes); and male, Cooking Lake, Alberta, June 13, 1937, F. O. Morrison (Alta.). This species appears to be common along the banks of rivers in the Northwest.

100. *Stenochironomus unictus*, new species

Male: Wing 3.4 mm. long; leg ratio ? (fore tarsi of type missing); antennal ratio 2.45.

Very pale green. Head, thorax, and legs pale stramineous tinged with green; mouthparts and flagellum beyond the first segment brown; wing and wing veins pale except that there is a dusky streak along vein Cu_2 (fig. 222); apical abdominal segments with the usual subcutaneous black blotches.

Genitalia: Figure 100, drawn from the type. Rather similar to those of *S. macateei* (fig. 101).

Female: Unknown.

Type: Male, Atsion, N. J., June 3, 1939, H. K. Townes (Townes).

101. *STENOCHIRONOMUS MACATEEI* (Malloch)

Chironomus macateei Malloch, 1915, Proc. Biol. Soc. Wash. 28:45; type locality: Plummers Island, Md. (USNM).

Chironomus (Stenochironomus) macateei Johannsen, 1942, Ent. News 53:72; description.

Male: Wing 2.6 mm. long; leg ratio 1.15; antennal ratio 2.0.

Very pale green. Head with its appendages, thorax, and legs pale stramineous tinged with green; flagellum beyond the first segment pale brown; apical abdominal segments with the usual subcutaneous black blotches.

Genitalia: Figure 101. The apical part of the ninth tergite is unusually narrow, leaving the superior appendage exposed from a dorsal view.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and females from Alabama (Flatwood in Wilcox County, La Place near Tuskegee, and Leroy); Arkansas (Galloway); Iowa (Davenport); Maryland (Plummers Island); Missouri (Atherton); New York (Croton Reservoir, Greenwood Lake, and Milford Center); Oklahoma (Muse); and South Carolina

(Greenville). Adults have been collected from May 23 at Plummers Island, Md., to August 28 at Galloway, Ark.

102. STENOCHIRONOMUS HILARIS (Walker)

- Chironomus hilaris* Walker, 1848, List Dipterous Ins. Brit. Mus. 1:17; type locality: Not stated (British Museum).
Chironomus nephopterus Mitchell, 1908, Jour. N. Y. Ent. Soc.; type locality: Cabin John, Md. (USNM).
Chironomus nephopterus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:429; description.
Chironomus hilaris Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:276; notes on the type, synonymy.
Chironomus (Stenochironomus) hilaris Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:28; generic position.

Male: Wing 3.2 mm. long; leg ratio 1.15; antennal ratio 2.2.

Pale green, usually somewhat darker green than in other Nearctic species of the genus. Flagellum beyond the first segment and mouthparts brown; lateral lobe of mesoscutum with a brown stripe in front of the wing base; postnotum marked with brown; wing marked with pale fuscous as in figure 223; apical 0.5 to 0.7 of femora brown, the hind femur being more extensively brown than the others; front and hind tibia entirely brown or the front tibia with a broad indistinct pale annulus centering just beyond its middle; middle tibia with its basal 0.3 brown; apical abdominal segments with the usual subcutaneous black blotches; genitalia brown.

Genitalia: Indistinguishable from those of *S. taeniapennis* (fig. 103).

Female: Colored like the male except that the wing and femoral dark markings are more extensive and that the front tibia is always entirely brown.

Material: Many males and females from Alabama (Sheffield); District of Columbia (Washington); Florida (West Palm Beach); Illinois (Carbondale, Champaign, Monticello, Muncie, Urbana, and White Heath); Indiana (Indianapolis and La Fayette); Maine (Orono); Maryland (Cabin John, Forest Glen, Jackson's Island, and Plummers Island); Michigan (Detroit, East Lansing, Manistee County, Midland County, and Osceola County); Missouri (Atherton); New Jersey (Atsion, Clarenton, Delaware Water Gap, and Riverton); New York (Canadarago Lake, Croton Reservoir, Glenida Lake, Green Lake in Fulton County, Greenwood Lake, Hancock, Hinckley, Ithaca, Kensico Reservoir, Kinderhook, Milford Center, Muscoot Reservoir, Old Forge, and Otsego Lake); North Carolina (Hendersonville); Oklahoma (Eagletown, Grandfield, Muse, Oswalt, and Sherwood); Ontario (Arnprior, Lake Openogo, Ottawa, and Point Pelee); Pennsylvania (Bucks County, Natrona, and Philadelphia); Virginia (Dead Run in Fairfax County and Great Falls); and Wisconsin (Polk County). Adults are most abundant in the summer months. At Plummers Island, Md., they have been collected from April 25 to October 11. This species is most often collected around lakes, while the closely related *S. taeniapennis* is most common around streams and rivers.

103. STENOCHIRONOMUS TAENIAPENNIS (Coquillett)

- Chironomus taeniapennis* Coquillett, 1901, Proc. U. S. Nat. Mus. 23:607; type localities: Andover, Mass., and Delaware Water Gap, N. J. (USNM).
Chironomus taeniapennis Johannsen, 1905, Bull. N. Y. State Mus. 86:203; description; *hilaris* is confused with *taeniapennis* here.

Chironomus exquisitus Mitchell, 1908, Jour. N. Y. Ent. Soc. **16**:11; type locality: Cabin John, Md. (USNM). New synonymy.

Chironomus zonopterus Mitchell, 1908, Jour. N. Y. Ent. Soc. **16**:12; type locality: Clementon, N. J. (USNM). New synonymy.

Chironomus taeniapennis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:430; description.

Chironomus (Stenochironomus) taeniapennis Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**:28; generic position.

Chironomus (Stenochironomus) exquisitus? Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**:29; description of larva.

Male: Wing 3.3 mm. long; leg ratio 1.15; antennal ratio 2.2.

Pale green. Flagellum beyond the first segment and mouthparts brown; lateral lobe of mesoscutum with a brown stripe in front of the wing base; postnotum marked with brown (These thoracic brown markings are sometimes very pale.); wing marked with pale fuscous as in figure 224, rarely the space between veins C and M fuscous as in *S. hilaris* (fig. 223); apical 0.2 of femora and basal 0.2 of tibiae brown, or these markings slightly more extensive in the hind leg; apical 0.3 of hind tibia brown; apical abdominal segments with the usual subcutaneous black blotches; genitalia brown.

Genitalia: Figure 103. Indistinguishable from those of *S. hilaris*.

Female: Colored like the male except that the wing and leg markings are somewhat darker and more extensive. The space between veins C and M is always fuscous, the hind tibia usually brown, and as much as the apical 0.5 of the femora may be brown. As in other species of the genus, the black subcutaneous blotches in the apical abdominal segments are less extensive in the female than in the male.

Very similar to *S. hilaris* but with less extensive dark markings. This may be the same species as the common European *S. fascipennis* (Zetterstedt), but I have seen no specimens of the latter, and the descriptions by European authors do not quite fit American specimens.

Material: Many males and females from California (Lake Tahoe); Connecticut (Stafford); Hudson Bay Territory; Iowa (Davenport); Illinois (Algonquin); Indiana (Indianapolis and La Fayette); Maryland (Plummers Island); Massachusetts (Belcher-town); Michigan (Ann Arbor, Douglas Lake, East Lansing, Manistee County, Midland County, Niles, and Ontonagon County); New Jersey (Clementon and Delaware Water Gap); New York (Barrytown, Bemus Point, Canadarago Lake, Canajoharie, Croton Reservoir, Farmingdale, Gloversville, Hancock, Hoosick, Hyde Park, Ithaca, Kinderhook, Little Falls, Milford Center, Otsego Lake, Rhinecliff, Rome, Sea Cliff, Sport Island in the Sacandaga River, and Staatsburg); North Carolina (Black Mountains); Ontario (Ottawa); Pennsylvania (Philadelphia); Quebec (Aylmer, Hull, and Quebec); Rhode Island (Westerly); South Carolina (Greenville); and South Dakota (Brookings). Adults may be collected throughout the summer months. In central New York, they have been taken from June 20 to September 4. The earliest and latest dates of capture known to me are April 25 at Plummers Island, Md., and September 6 at East Lansing, Mich.

Genus XENOCHIRONOMUS

Xenochironomus Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle **29**: 69. Genotype: *Chironomus xenolabis* Kieffer (by present designation).

Palpus with 4 segments; male flagellum with 11, female with 5 segments;

antennal ratio 2.7 to 6.5; frontal tubercles absent; pronotum medially completely divided by a narrow notch, often slightly narrowed medially, even with or somewhat surpassed by the anterior end of mesoscutum (fig. 237); squamal fringe present; wing membrane without macrotrichia; ends of R_1 and of R_{2+3} slightly but distinctly separated; end of M somewhat nearer the wing apex than is the end of R_{4+5} ; leg ratio 1.3 to 1.6; tarsal beard present or absent; fore tibia with an inner apical low rounded scale which projects only slightly beyond a similar scale on the other side of the tibia; combs of middle and hind tibiae broadly triangular, usually similar in size and shape, adjacent but usually separated by a distinct notch, each with a spine or sometimes with super-numerary spines; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present, very broad and strongly bent downwards; superior appendage lobe-shaped to linear, with several to many setae; inferior appendage lobe-shaped to linear, with many setae. See figures 104 to 108.

It may be that the resemblance between *X. xenolabis* and the other Nearctic species placed in this genus is only superficial and that a separate genus should be erected for the latter. The larva and pupa of *X. xenolabis* are known. Discovery of the immature stages of other Nearctic species will shed considerable light on the relationships.

Except for *X. xenolabis*, our species are of Neotropical origin.

KEY TO THE NEARCTIC SPECIES OF XENOCHIRONOMUS

1. Spines on combs of hind tibiae very close together; leg ratio about 1.8; female with three black mesoscutal stripes 108. *dorneri* (Malloch)
 Spines on combs of hind tibiae separated as widely as in *Tendipes* (accessory spines sometimes present); leg ratio 1.35 to 1.65; female with a single black mesoscutal stripe or without any black mesoscutal markings 2
2. Wing about 3.3 mm. long; mesoscutum without a median black stripe; superior appendage of male genitalia about half as wide as long (fig. 104) 104. *xenolabis* (Kieffer)
 Wing about 5.5 mm. long; mesoscutum of female with a median black stripe; superior appendage of male genitalia longer than wide (figs. 105 to 107) 3
3. Inferior appendage of male genitalia neither longer nor wider than superior appendage (fig. 105) 105. *scopula*, new species
 Inferior appendage of male genitalia about twice as long as the superior appendage and somewhat wider (figs. 106 and 107) 4
4. Inferior appendage about 2.3 as long as wide (fig. 106) 106. *festivus* (Say)
 Inferior appendage about 4.0 as long as wide (fig. 107) 107. *taeniolatus* (Say)

104. XENOCHIRONOMUS XENOLABIS (Kieffer)

- Chironomus xenolabis* Kieffer, 1916, Arch. Hydrobiol. Suppl. 2:526; type locality: Huskvarna Aa, Sweden (location of type unknown).
Xenochironomus xenolabis Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle 29:70; generic position.
Chironomus (*Xenochironomus*) *xenolabis* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:46; description of larva and pupa.
Chironomus (*Chironomus*) *xenolabis* Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:61, 62; biology.

Male: Wing 3.3 mm. long; leg ratio 1.55; antennal ratio 2.9; pronotum narrowest in the middle, as narrow as in *Tanytarsus*; fore tarsus without a beard; tibial spurs separated as in *Tendipes*; accessory spurs absent.

Light pea green. Pedicel and thoracic markings ochraceous; palpus and flagellum beyond the first segment brownish; legs pale green, darkening to brown towards their apices; wing veins pale brown; halter pale green to stramineous.

Genitalia: Figure 104. The very short superior appendage is distinctive.

Female: Similar to the male except for the usual sexual differences.

I have seen a pair of specimens from England in the United States National Museum determined as this species by Edwards. It seems possible that the present species as defined here and by European authors is in reality a complex of similar species. Some of the varieties described by European authors, if correctly described, seem to be more than individual variants. American specimens seem to be all one species.

Material: Many males and females from Iowa (Davenport); Maryland (Plummers Island); Massachusetts (Holliston); Michigan (Saginaw County); New Jersey (River-ton); New York (Brainerd, Canajoharie, Cobleskill, Croton Reservoir in Westchester County, Hancock, Kinderhook, Milford Center, Niagara Falls, Otsego Lake, Pough-keepsie, Scarboro, and Valley Falls); Ohio (Summit County); Oklahoma (Grant); Ontario (Black Rapids in the Rideau River, Costello Lake in Algonquin Park, Ottawa, Point Pelee, Ridgeway, and Rockport); Oregon (Deschutes River near Redmond and Takenitch Lake); Quebec (Aylmer, Beloeil, Hull, and Norway Bay); and Virginia (Grassymead). Adults have been collected from June 2 on Point Pelee, Ontario, to September 11 at Niagara Falls, N. Y. They are common in the summer around many lakes, rivers, and creeks. The species is widely distributed in Europe.

105. *Xenochironomus scopula*, new species

Male: Wing 6.0 mm. long; leg ratio 1.4; antennal ratio 5.0; pronotum not narrowest near the middle (fig. 237), as wide as in *Tendipes plumosus*; fore tarsus with a long, rather dense beard; spines of tibial combs separated as in *Tendipes*; tibial combs often with one or several supernumerary spines.

Coloration as in *X. festivus*, but the dark bands on the abdomen usually narrower, paler, and not so distinctly widened at the middle.

Genitalia: Figure 105. The shape of the inferior appendage is distinctive.

Female: Colored like that of *X. festivus*.

Type: Male, St. Lawrence River at Batiscan, Quebec, June 12, 1938, H. and M. Townes (Townes).

Paratypes: Thirteen males, 4 females, collected with the type and 57 males, 17 females, from Alberta (Medicine Hat); Illinois (Chicago and Mackinaw River at Lilly); Indiana (Marion County); Kansas (Manhattan); Manitoba (Teulon); Massachusetts (Hadley); Michigan (Bay County, Detroit, Floodwood in Schoolcraft County, Hart, Iosco County, Isabella County, Midland County, Nottawa, Ogemaw County, St. Joseph, and St. Joseph River at Berrien Springs); Montana (Glasgow and Great Falls); New York (Canajoharie

and Ithaca); Ontario (Moosonee, Ottawa, and Point Pelee); and Quebec (Lachine and Quebec). Paratypes are in the collections of Townes, Dreisbach, Sabrosky, Canadian National Collection, United States National Museum, Harvard, Ohio, Illinois, Massachusetts, and Cornell. According to my experience, this species breeds only in larger rivers. Adults are common throughout the summer. They have been collected from May 14 at Manhattan, Kans., and May 17 in Midland County, Mich., to August 14 at Teulon, Manitoba.

106. *Xenochironomus festivus* (Say), new combination

Chironomus festivus Say, 1823, Jour. Acad. Nat. Sci. Phila. 3:13 (Leconte Ed. 2:41); type locality: Illinois (type probably destroyed).

Chironomus lineatus Say, 1823, Jour. Acad. Nat. Sci. Phila. 3:14 (Leconte Ed. 2:42); type locality: Pennsylvania (type probably destroyed).

Chironomus festivus Wiedemann, 1828, Aussereuropäische zweiflüglige Insekten 1:16; description.

Chironomus lineola Wiedemann, 1828, Aussereuropäische zweiflüglige Insekten 1:17; description; new name for *Chironomus festivus* Say.

Chironomus lasiomerus Walker, 1848, List Dipterous Ins. Brit. Mus. 1:19; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum). New synonymy.

Chironomus lineatus Johannsen, 1908, Bull. N. Y. State Mus. 124:280; description.

Chironomus festivus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:470; synonymy, description.

Chironomus lineatus Kieffer, 1917, Ann. Mus. Nat. Hung. 15:344; description.

Male: Wing 5.5 mm. long; leg ratio 1.5; antennal ratio 6.0; pronotum not narrowest near the middle, as wide as in *Tendipes plumosus*; a fore tarsus with a long rather dense beard; spines of tibial combs separated as in *Tendipes*; tibial combs often with one or several supernumerary spines.

Head and thorax light green with ochraceous markings; abdomen light green. Antenna brown; wing veins faintly tinged with brown, vein r-m brown; knob of halter pale green; legs greenish, ochraceous towards their apices; bases of tibiae and apices of all leg segments brown (especially dark in the front legs); abdominal tergites 2 to 6 with an apical transverse brown band, widest at the center and sometimes reduced to a central spot; apical part of abdomen more or less yellowish brown.

Genitalia: Figure 106. The shape of the inferior appendage is distinctive. The superior appendage is usually more pointed than figured.

Female: Front half of mesoscutum with a narrow black central stripe; body somewhat darker green than in the male; abdomen uniformly green, the apical part somewhat yellowish brown. Otherwise similar to the male except for the usual sexual differences.

Say's descriptions of *Chironomus festivus* and of *C. lineatus* will fit the preceding and the following species as well as the present one. No author has previously distinguished between these three species, but Malloch figured genitalia, designated *C. festivus* Say, that are recognizable as belonging to this species. Malloch's series, however, was mixed. The species figured by Malloch is selected to bear the name *festivus* Say. Malloch synonymized *lineatus* Say with *festivus* Say, and since there is no definite evidence that the two are not

the same, his synonymy is followed. I am indebted to Dr. John Smart, of the British Museum, for notes on the type of *Chironomus lasiomerus* Walker.

Material: Many males and females from Illinois (Salt Fork at St. Joseph); Kansas (Douglas County); Maryland (Forest Glen); New Jersey (Moorestown, Riverside, Riverton, and Westville); New York (Germantown and Hudson); Oklahoma (Fort Gibson); Ontario (Fitzroy Harbor); Quebec (Chambly County, Hull, Lachine, Montreal, Ottawa Golf Club, and Queens Park in Aylmer); and Virginia (Lake Drummond). According to my experience, this species breeds only in larger rivers. Adults are common throughout the summer. They have been collected from May 26 in Chambly County, Quebec, to August 25 at the Ottawa Golf Club in Quebec.

107. *Xenochironomus taenionotus* (Say), new combination

Chironomus taenionotus Say, 1829, Jour. Acad. Nat. Sci. Phila. 1:149 (Leconte Ed. 2:348); type locality: Illinois (type destroyed).

Male: Wing 5.0 mm. long; leg ratio 1.5; antennal ratio 4.8; pronotum not narrowest near the middle, as wide as in *Tendipes plumosus*; fore tarsus with a long moderately dense beard; spines on tibial combs separated as in *Tendipes*; tibial combs often with one or several supernumerary spines.

Coloration as in *X. festivus* except that the dark bands on the abdomen are usually wider and darker.

Genitalia: Figure 107. The shapes of the superior and inferior appendages are distinctive.

Female: Not definitely known, but probably colored like that of *X. festivus*.

Say's description* fits females of the present species or of *festivus* or of *scopula* equally well except that the length was given as "more than one-fifth of an inch." The size fits the present species best. Say stated that the mesopostnotum had a central black spot. Presumably the mesopostnotum of his specimen was discolored.

Material: Five males, Plummers Island, Md., August 26, 1902, Barber and Schwarz (USNM and Townes); male, Washington, D. C., August 1907, Wm. Palmer (USNM); male, Washington, D. C., M. L. Linell (USNM); male Galena Junction, Ill., July 8, 1917 (Ill.); male, Davenport, Iowa, July 27, 1941, U. A. Hauber (Hauber); male, Takoma Park, Md., August 22, 1943, H. K. Townes (Townes); male, Detroit, Mich., July 24, 1933 (USNM); male, Atco, N. J., June 4, C. W. Johnson (Harvard); male, Farmingdale, N. J., July 14, C. W. Johnson (Townes); male, Riverton, N. J., July 17, C. W. Johnson (Harvard); 2 males, Riverton, N. J., July 24, C. W. Johnson (Harvard and Townes); male, Westville, N. J., July 2, C. W. Johnson (Harvard); male, Philadelphia, Pa., June 18, 1895 (Kans.); male, Philadelphia, Pa., July 25, C. W. Johnson (Harvard).

108. *Xenochironomus dorneri* (Malloch), new combination

Chironomus dorneri Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:471; type locality: Brownsville, Tex. (Ill.).

Male: Wing 3.4 mm. long; leg ratio 1.8; antennal ratio 1.4; pronotum narrowest in the middle, as narrow as in *Tanytarsus*; fore tarsus without a beard; spines of hind tibial combs very close together, the apex of the outer

spine reaching to the base of the inner spine; spines of middle tibia separated almost as widely as in *Tendipes*.

Head and thorax ochraceous, somewhat marked with light brown and pale green; flagellum beyond first segment brown; abdomen brown, the basal 0.25 and apical 0.1 of each tergite paler; wing veins brown; wing membrane iridescent and tinged with brown; halter knob pale brown; legs ochraceous brown, the middle and hind tarsi brown towards their apices and the fore tibia and tarsus and apex of fore femur brown.

Genitalia: Figure 108?. Very distinct, though fundamentally similar to those of the *festivus* group of species.

Female: Mesoscutum with three blackish-brown stripes; the central stripe about 2.0 as long as broad, beginning at the front end and extending back for 0.25 the length of the mesoscutum; the lateral stripes each about 4.0 as long as broad and extending from the back end forward for 0.65 the length of the mesoscutum. Each stripe is broadest in front. Postnotum dark brown; abdomen pale brown, each segment with a brown apical transverse band. Otherwise similar to the male except for the usual sexual differences.

I can not be sure that the male and female described above are the same species or that either of them are Malloch's *dorneri*. There seems to be a number of Neotropical species closely related to *dorneri*, but the material available is scanty. The male specimen described and figured above is the only available male that can possibly be Malloch's *dorneri*.

Material: Male, Barro Colorado Island, Canal Zone, December 22, 1928, C. H. Curran (Amer. Mus.); 2 females, La Belle, Fla., May 8 to 10, 1916, J. C. Bradley (Cornell and Townes).

Genus CRYPTOCHIRONOMUS

Cryptochironomus Kieffer, 1918, Ent. Mitteil. 7:38. Genotype: (*Tendipes* (*Cryptochironomus*) *chlorolobus* Kieffer) = *supplicans* (Meigen) (original designation).

Palpus with 4 segments; male flagellum with 11, female with 5 segments; antennal ratio 2.7 to 5.5; frontal tubercles present or absent; pronotum evenly and moderately narrowed towards the center, not produced or notched medially, even with or slightly surpassed by the anterior part of the mesoscutum (fig. 238); squamal fringe present; wing membrane without macrotrichia; fork of Cu somewhat beyond r-m; ends of R_1 and R_{2+3} slightly but distinctly separated; ends of R_{4+5} and M equidistant from the wing apex; leg ratio 1.1 to 2.1; tarsal beard present or absent; fore tibia with an inner apical low rounded scale which projects only slightly beyond a similar scale on the other side of the tibia; combs of middle and hind tibiae broadly triangular, similar in shape, adjacent but usually with a distinct notch between them, each with a short spine; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present; superior appendage small, lobe-shaped, and with many setae; inferior appendage very small, sclerotized, and with several setae; style and coxite ankylosed. See figures 109 to 114. In the draw-

ings of genitalia for this genus the inferior rather than the superior appendage is stippled.

KEY TO THE NEARCTIC SPECIES OF CRYPTOCHIRONOMUS

1. Upper edge of anal point of male genitalia broad and flat (figs. 109 and 110)..... 2
 Upper edge of anal point of male genitalia narrow, not at all widened (figs. 111 to 114) 3
2. Inner apical edge of style straight or nearly straight (fig. 109).....
 109. *sorex*, new species
 Inner apical edge of style emarginate (fig. 110)..... 110. *scimitarus*, new species
3. Style about 2.7 as long as wide and slightly curved (fig. 111); frontal tubercles usually absent; fore tarsus of male without a beard or with a very short beard 111. *fulvus* (Johannsen)
 Style about 2.7 to 4.0 as long as wide and strongly curved (figs. 112 to 114); frontal tubercles present; fore tarsus with a long, but often very sparse, beard..... 4
4. Style about 4.0 as long as wide (fig. 112); wing about 3.5 mm. long.....
 112. *blarina*, new species
 Style about 2.7 to 3.3 as long as wide (figs. 113 and 114); wing about 3.9 to 5.2 mm. long 5
5. Fore tarsus of male with a sparse or very sparse long beard; style weakly broadened toward its apex (fig. 113)..... 113. *digitalis* (Malloch)
 Fore tarsus of male with a rather dense long beard; style strongly broadened towards its apex (fig. 114)..... 114. *psittacinus* (Meigen)

109. *Cryptochironomus sorex*, new species

Male: Wing 2.7 mm. long; leg ratio 1.95; antennal ratio 3.1; frontal tubercles very small or absent; mesoscutum with a slight hump at the posterior end of the median vitta; fore tarsus without a beard.

Head and thorax ochraceous, abdomen greenish with the apical part more or less brown. Flagellum except basal segment and palpus brown; legs ochraceous; fore tibia and tarsus and apex of fore femur brown; apical part of middle and hind tarsi brown.

Genitalia: Figure 109. This and *C. scimitarus* (fig. 110) are the only two Nearctic species of the genus with a broad anal point. They may be distinguished on the shape of the style. In addition, the anal point in *C. sorex* is longer and narrower and the converging scleromes coming from the dorsal anterior margin of the ninth tergite are longer and stronger than in *C. scimitarus*.

Female: Unknown.

Type: Male, Chautauqua Lake at Bemus Point, N. Y., August 14, 1937, H. K. Townes (Townes). Mounted on a microscope slide with its larval and pupal skins.

Paratypes: Two males, Chautauqua Lake at Bemus Point, N. Y., August 12, 1937, and August 14, 1937, H. K. Townes (Townes); male, Ithaca, N. Y., May 20, 1934, H. K. Townes (Townes); male, Troy, N. Y., September 2, 1934, H. K. Townes (Townes); male, Westchester County, N. Y., June 19, 1936, H. K. Townes (Townes).

110. *Cryptochironomus scimitarus*, new species

Chironomus (*Chironomus*) sp. a, Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:61, 62; biology.

Male: Wing 3.0 long; leg ratio 1.73; antennal ratio 3.3; frontal tubercles small or sometimes absent; mesoscutum with a slight hump at the posterior end of the median vitta; fore tarsus without a beard.

Head and thorax ochraceous, abdomen greenish with the apical part more or less brown. Flagellum except basal segment and palpus brown; legs ochraceous; fore tibia and tarsus and apex of fore femur brown; apical part of middle and hind tarsi brown.

Genitalia: Figure 110. Compare with those of *C. sorex* (fig. 109).

Female: Unknown.

Type: Male, Chautauqua Lake at Bernus Point, N. Y., August 10, 1937, H. K. Townes (Townes). Mounted on a microscope slide with its pupal skin.

Paratypes: Male, Plummers Island, Md., May 9, 1914, R. C. Shannon (USNM); 2 males, Bay County, Mich., September 7, 1940, R. R. Dreisbach (Dreisbach); 2 males, Bemus Point, N. Y., July 24, 1937, H. K. Townes (Townes); male, Ithaca, N. Y., September (Cornell); 3 males, Ithaca, N. Y., May 26, 1937, June 5, 1937, and July 1, 1937, J. G. Rempel (Rempel); male, Kingston, N. Y., June 22, 1936, H. K. Townes (Townes); 3 males, Costello Lake, Algonquin Park, Ontario, June 22, 1937, June 27, 1937, and August 10, 1937, R. B. Miller (Miller); and male, Ottawa, Ontario, September 2, 1924, F. P. Ide (CNC).

111. *CRYPTOCHIRONOMUS FULVUS* (Johannsen)

Chironomus fulvus Johannsen, 1905, Bull. N. Y. State Mus. 86:224; type locality: Ithaca, N. Y. (Johannsen collection). The pupa described belongs probably to *Harnischia emorsa*.

Chironomus abbreviatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:451; type locality: Havana, Ill. (Ill.). New synonymy.

Chironomus fulvus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:478; description (Malloch's series was mixed).

Chironomus parvilamellatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:479; type locality: Grand Tower, Ill. (Ill.). New synonymy.

Chironomus sp. C, Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:529; description of larva and pupa.

Chironomus abbreviatus Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:409; biology.

Chironomus mallochi Kieffer, 1919, Bull. Soc. Ent. France, p. 191; new name for *Chironomus abbreviatus* Malloch.

Chironomus fulvus Townes, 1937, Ann. Rpt. N. Y. State Conservation Dept. 26, suppl.: 224, 225; biology.

Chironomus (*Cryptochironomus*) *fulvus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:39; description of larva and pupa.

Chironomus fulvus Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, Suppl.: 171; biology.

Chironomus (*Cryptochironomus*) *parvilamellatus* Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 3; generic position.

Male: Wing 3.0 mm. long; leg ratio 1.65; antennal ratio 3.0; frontal tubercles absent or sometimes present and very small; mesoscutum with a slight hump at the posterior end of the median vitta; fore tarsus bare or occasionally with a short inconspicuous beard.

Head and thorax ochraceous, abdomen greenish with the apical part more or less brown. Flagellum except basal segment and palpus brown; legs ochraceous; fore tibia and tarsus and apex of fore femur brown; apical part of middle and hind tarsi brown.

Genitalia: Figure 111. The slender anal point, and stout slightly curved style are distinctive.

Female: Abdomen ochraceous. Otherwise similar to the male except for the usual sexual differences.

This species is near the European *C. supplicans* (Meigen), but the latter has the male fore tarsus bearded and the genitalia with the anal point slightly wider at its base and apex.

Material: Many males and females from California (Clear Lake at Nice); Colorado (Hayden); District of Columbia (Washington); Florida (West Palm Beach); Idaho (Coeur d'Alene); Illinois (Big Muddy River at Grand Tower, Burlington, Chicago, and Muncie); Iowa (Amana and Davenport); Kansas (Lawrence); Louisiana (Mound); Manitoba (Churchill and Churchill River 20 miles south of Churchill); Maryland (Forest Glen and Plimmers Island); Massachusetts (Holliston and South Hadley); Michigan (Arenac County, Bay County, Benzie County, Brevort, Chippewa County, Isabella County, Isle Royal, Mackinac Island, Midland County, Missaukee County, Montcalm County, South Haven, and Tuscola County); Minnesota (Cass Lake, Luverne, and St. Anthony Park); Mississippi (Bay St. Louis); Montana (Laurel and Missoula); Nebraska; New Jersey (Clementon, Delaware Water Gap, Medford Lakes, Moorestown, Riverton, and Riverside); New York (Babylon, Bemus Point, Bridgeboro, Buel, Canadarago Lake, Canajoharie, Connecticut Hill in Tompkins County, Eagle Bridge, Elmira, Grand Island, Hancock, Hoosick Junction, Hudson, Ithaca, Kinderhook, Mayville, Milford Center, Oneonta, North Petersburg, Rochester, and Stillwater); Oklahoma (Chickasha, Lugert, and Oklahoma City); Ontario (Fort Erie, Normandale, Ottawa, and Point Pelee); Quebec (Batiscan, Coteau du Lac, and Kirk's Ferry); Rhode Island (Westerly); Virginia (Falls Church); and Washington (Orondo and Mt. Rainier at 5,000 ft.). Adults occur throughout the growing season. Early and late collecting dates are April 22 at Grand Tower, Ill.; May 8 at Forest Glen, Md.; May 15 at South Hadley, Mass.; September 12 at Ithaca, N. Y.; September 16 at Davenport, Iowa; and October 31 at West Palm Beach, Fla.

112. *Cryptochironomus blarina*, new species

Male: Wing 3.5 mm. long; leg ratio 1.5; antennal ratio 3.7; frontal tubercles small; mesoscutum with a slight hump at the posterior end of the median vitta; fore tarsus with a moderately long rather sparse beard.

Head and thorax light greenish brown, strongly pruinose and with brown markings; abdomen dark brown. Pedicel, flagellum except base, and palpus brown; legs brownish pale green; fore tibia brownish at base and apex; fore tarsus and apical part of middle and hind tarsus brown.

Genitalia: Figure 112, drawn from the type. The long, narrow, evenly curved style is distinctive.

Female: Unknown.

Type: Male, Chautauqua Lake at Mayville, N. Y., July 27, 1937, H. K. Townes and G. E. Burdick (Townes).

Paratypes: Male collected with the type (Townes); male, Farmingdale, N. Y., August 3, 1938, H. K. Townes (Townes); male, Normandale, Ontario, June 4, 1931, G. S. Walley (CNC).

113. CRYPTOCHIRONOMUS DIGITATUS (Malloch)

Chironomus digitatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:483; type locality: Thompson's Lake, Havana, Ill. (Ill.); description of larva, pupa, and adult.

Chironomus digitatus Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:410; biology.

Chironomus digitatus Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. 14:56; biology.

Chironomus digitatus Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15:362, 373, 415; biology.

Chironomus digitatus Richardson, 1928, Bull. Ill. Nat. Hist. Surv. 17:407; biology.

Chironomus (Cryptochironomus) styliifera var. a, Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:38; description of larva, pupa, and adult.

Chironomus (Cryptochironomus) digitatus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:39; description of larva and pupa.

Male: Wing 4.1 mm. long; leg ratio 1.5; antennal ratio 4.0; frontal tubercles rather small; mesoscutum with a rather conspicuous hump at the posterior end of the median vitta; fore tarsus with a long sparse or very sparse beard.

Ochraceous, the head and thorax marked with darker ochraceous. Flagellum except base and palpus brown; legs ochraceous; fore tibia brownish at base and apex; fore tarsus and apical part of middle and hind tarsus brown; posterior margin of abdominal tergites 1 through 4 with a transverse brown band; genitalia tinged with brown. Some specimens, especially those collected in early spring, have an olive-green ground color with the mesoscutal vittae and other darker markings brownish black.

Genitalia: Figure 113. In the shape of the style, intermediate between those of *C. blarina* (fig. 112) and of *C. psittacinus* (fig. 114).

Female: Abdomen uniformly brownish ochraceous. Otherwise similar to the male except for the usual sexual differences.

Material: Many males and females from California (Truckee); Illinois (Burlington); Iowa (Crystal Lake at Davenport); Massachusetts (South Hadley and Worcester); Michigan (Iosco County); Minnesota (Lake City); New Jersey (Moorestown); New York (Albany, Bemus Point, Canajoharie, Germantown, Ithaca, Mayville, and Syracuse); Ohio (Portage Lakes); Ontario (Point Pelee and Trenton); and South Dakota (Big Stone City and Waubay). Adults occur throughout the growing season. They have been collected from April 30 at Davenport, Iowa, and May 8 at Syracuse, N. Y., to September 13 at Trenton, Ontario.

114. CRYPTOCHIRONOMUS PSITTACINUS (Meigen)

Chironomus psittacinus Meigen, 1830, System. Besch. europ. zweifl. Ins.; type locality: Europe (Paris museum).

- Chironomus stylifera* Johannsen, 1908, Bull. N. Y. State Mus. 124:281; type locality: Ithaca, N. Y. (Johannsen collection). New synonymy.
- Chironomus obtusilobus* Malloch, 1923, N. Amer. Fauna 46:171; type locality: St. George Island, Alaska (USNM). New synonymy.
- Chironomus farinalis* Walley, 1926, Canad. Ent. 58:205; type locality: Lethbridge, Alberta (CNC). New synonymy.
- Chironomus* (*Cryptochironomus*) *psittacinus* Goetghebuer, 1928, Faune de France 18:78; generic position.
- Chironomus* (*Cryptochironomus*) *stylifera* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:21; generic position.
- Chironomus* (*Cryptochironomus*) *stylifera* Lindeman, 1941, Amer. Midland Nat. 26:645; biology.

Male: Wing 4.8 mm. long; leg ratio 1.15; antennal ratio 5.0; frontal tubercles rather small; mesoscutum with a conspicuous hump at the posterior end of the median vitta; fore tarsus with a long rather dense beard.

Body entirely blackish brown, to ochraceous with the abdomen pale green; thorax pruinose. Legs stramineous to greenish brown or brown; coxae, femora, fore tibia and tarsus, apices of middle and hind tibiae, and middle and hind tarsi except at the base darker than the rest of the legs.

Genitalia: Figure 114. The shape of the style is distinctive.

Female: Similar to the male except for the usual sexual differences.

I have compared Nearctic material with two males from England, determined by Edwards.

Material: Many males and females from Alaska (St. George Island and St. Paul Island in the Bering Sea); Alberta (Beaver Lake, Millarville, and Wabamun); British Columbia (Columbia River at Carbonate, and Oliver); Colorado: Manitoba (Aweme, Churchill, and Delta); Michigan (Benzie County, Manistee County, Otsego County, and Washtenaw County); Minnesota (Browns Valley); Oregon (Klamath Falls); Saskatchewan (Attens Lake at Cut Knife); and South Dakota (Big Stone City). Adults have been collected from April 11 at Oliver, British Columbia, to September 2 at Klamath Falls, Oregon.

Genus TENDIPES

Palpus with 4 segments; male flagellum with 11, female with 5 segments; antennal ratio 1.9 to 7.0; frontal tubercles usually present (fig. 260); pronotum usually with a very weak median notch but never completely interrupted by a median notch, even with or without surpassed by or surpassing the anterior end of the mesoscutum (figs. 232 and 239); squamal fringe present; wing membrane without macrotrichia except in the European *T. (Kiefferulus) tendipediformis* (Goetghebuer); ends of R_1 and R_{2+3} slightly but distinctly separated; ends of R_{4+5} and M equidistant from the wing apex; leg ratio 0.95 to 1.9; fore tibia with an inner apical low rounded scale which projects only slightly beyond a somewhat similar scale on the opposite side of the tibia (fig. 250); combs of middle and hind tibiae broadly triangular, usually similar in shape, adjacent, but usually with a distinct notch between them, each with a short spine (fig. 257); pulvilli conspicuous lobes, entire (fig. 244).

Male genitalia: Anal point present; both appendages well developed, the inferior appendage always with numerous setae. See figures 115 to 151.

KEY TO THE NEARCTIC SUBGENERA OF TENDIPES

1. Inferior appendage of male genitalia very long and slender, strongly upcurved, and with an apical swollen setiferous part that is at least 2.0 as wide as the narrowest part of the appendage and less than 0.4 as long as the entire appendage (figs. 115 and 124) *Limnochironomus* p. 102
- Inferior appendage of male genitalia not unusually long, slender, curved, and swollen at the apex as described above 2
2. Inferior appendage very broad, oval, and flat (figs. 125A and 125B) *Kiefferulus* p. 110
- Inferior appendage not unusually broad, subcylindrical 3
3. Superior appendage of male genitalia with an abruptly enlarged setiferous base which occupies approximately 0.4 the length of the appendage, beyond which the appendage is abruptly narrowed, horn-shaped (figs. 126 to 129) *Einfeldia* p. 111
- Superior appendage of male genitalia without an abruptly enlarged base as described above 4
4. Superior appendage with numerous setae arising from its ventral surface (figs. 130 and 131); body polished, not pruinose *Chaetolabis* p. 114
- Superior appendage without setae beyond its base or rarely (in *T. (T) biseta*) with a very few setae (figs. 132 to 151) *Tendipes* p. 116

Subgenus LIMNOCHIRONOMUS

Limnochironomus Kieffer, 1920, Ann. Soc. Sci. Bruxelles **39**, c. r.: 166. Genotype: (*Tendipes falciformis* Kieffer) = *nervosus* (Staeger) (original designation).
Limnotendipes Lenz, 1937, Arch. Hydrobiol. Suppl. **15**: 6. Genotype: *Chironomus* (*Limnochironomus*) *flexus* Johannsen (monobasic). New synonymy.

Frontal tubercles present or absent; pronotum slightly or moderately narrowed medially, rarely with a narrow median notch, even with or somewhat exceeding the anterior end of the mesoscutum; fork of Cu beyond r-m; tarsal beard present or absent.

Male genitalia: Superior appendage usually more or less ligulate, usually with several apical bristles; inferior appendage long, narrow, upcurved, and with an expanded apical setiferous part; style strongly curved, usually slender. See figures 115 to 124.

There seem to be three species groups as follows: the *fumidus* group, containing *fumidus* and *lobiger* and characterized by the larger frontal tubercles, wide pronotum, bearded fore tarsus of male, short superior appendage of male genitalia, bristles on the end of the inferior appendage not arranged in regular rows, and large body size; the *leucoscelis* group, containing the species *leucoscelis* and characterized by the absence of frontal tubercles, narrow pronotum, unbearded fore tarsus, short superior appendage of genitalia, and bristles on the end of the inferior appendage not arranged in regular rows; and the *modestus* group, containing *californicus*, *modestus*, *neomodestus*, *aethiops*, *nervosus*, and *milleri*, and characterized by the very small (or absent) frontal tubercles, narrow to moderately wide pronotum, unbearded fore tarsus, long superior appendage of genitalia, and bristles on the end of the inferior appendage arranged in two rows.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS LIMNOCHIRONOMUS

1. Abdomen entirely brownish 2
- Abdomen entirely green or green with the apical segments more or less brownish 5

2. Front tarsus of male with a moderately long beard; wing length about 3.4 mm.
 116. *fumidus* (Johannsen) 3
 Front tarsus of male not bearded; wing length about 2.5 mm. 3
3. Superior appendage of male genitalia 1.0 to 1.5 as wide at the end as at the middle (fig. 121)..... 121. *aethiops*, new species
 Superior appendage of male genitalia 2.5 to 5.0 as wide at the end as at the middle (figs. 118 and 120) 4
4. Style of male genitalia banana-shaped, about 4.0 as long as wide (fig. 118).....
 118. *californicus* (Johannsen)
 Style of male genitalia sickle-shaped, about 6.5 as long as wide (fig. 120).....
 120. *neomodestus* (Malloch)
5. Basal 0.7 of basitarsi white, the apical 0.3 and all of the following segments dark brown..... 117. *leucoscelis*, new species
 Basal 0.7 of basitarsi not white, not strongly contrasting in color with the rest of the tarsi 6
6. Fore tarsus of male with a moderately long beard; wing length about 3.4 mm.; style of male genitalia about 3.5 as long as wide (fig. 115)..... 115. *lobiger* (Kieffer)
 Fore tarsus of male not bearded; wing length 2.0 to 3.0 mm.; style of male genitalia 6.0 to 8.0 as long as wide (figs. 119, 122A-C, 123, and 124) 7
7. Style of male genitalia very long and curved, about 8.0 as long as wide and the apical half very slender (fig. 124)..... 124. *milleri*, new species
 Style of male genitalia moderately long and curved, about 6.0 as long as wide, the apical half not unusually slender (figs. 119, 122A-C, and 123) 8
8. Superior appendage about 4.5 as wide at the end as at the middle (fig. 119).....
 119. *modestus* (Say)
 Superior appendage not more than 2.5 as wide at the end as at the middle (figs. 122A, 122B, 122C, and 123) 9
9. Superior appendage more or less truncate at the end (fig. 122A, 122B, and 122C).....
 122. *nervosus* (Staeger)
 Superior appendage tapered to a point, incurved at the end (fig. 123).....
 123. *boltaurus*, new species

115. TENDIPES (LIMNOCHIRONOMUS) LOBIGER (Kieffer)

Limnochironomus lobiger Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle 29:71; type locality: Ploen Lake, Schleswig-Holstein (location of type unknown).

Tendipes (Limnochironomus) lobiger Kruseman, 1933, Tijdschr. Ent. 76:175; description, generic position.

Male: Wing 3.4 mm. long; leg ratio 1.4; antennal ratio 2.7; frontal tubercles small, conical; pronotum wide above, projecting in front of the mesoscutum; front tarsus with a moderately long ragged beard.

Light green. Antenna and mouthparts brown; markings on mesoscutum and postnotum pale orange brown or rarely dark brown; wing veins pale brown; halter knob greenish white; legs stramineous darkening to brown toward their apices; apical abdominal segments and genitalia pale brown.

Genitalia: Figure 115. Rather similar to those of *T. (L.) fumidus* (fig. 116), but differing in the long narrow anal point and in the shape of the superior appendage.

Female: Similar to the male except for the usual sexual differences.

I have compared Nearctic material with a male and female from England, determined by Edwards.

Material: Two males, Isabella County, Mich., June 9, 1940, R. R. Dreisbach (Dreisbach, USNM); male, North Fairhaven, N. Y., August 20 to 30, 1918 (Cornell); and 10 males, Otsego Lake, N. Y., June 19, 1935, H. K. Townes (Townes, Rempel). This species occurs also in Europe.

116. *Tendipes (Limnochironomus) fumidus* (Johannsen),
new combination

Chironomus fumidus Johannsen, 1905, Bull. N. Y. State Mus. 86:221; type locality: Ithaca, N. Y. (Johannsen collection).

Chironomus incognitus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:480; type locality: Bank of Stony Creek, Muncie, Ill. (Ill.). New synonymy.

Chironomus (Limnochironomus) fumidus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:44; generic position. (Specimens described by Johannsen belong to *neomodestus*.)

Male: Wing 3.4 mm. long; leg ratio 1.52; antennal ratio 3.3; frontal tubercles small, conical; pronotum wide above, projecting in front of the meso-scutum; front tarsus with a moderately long ragged beard.

Dark grayish brown with a strong pruinescence. Wing veins brown; halter knob whitish to light pruinose brown; legs stramineous to light brown, the femora and tibiae at their bases and apices and apical part of tarsi brown.

Genitalia: Figure 116. Rather similar to those of *T. (L.) lobiger* (fig. 115) except for the short broad anal point and the shape of the superior appendage.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and females from Colorado (campus of the University of Colorado at Boulder and Fort Collins); District of Columbia (Washington); Illinois (Algonquin); Iowa (Davenport); Maryland (Cabin John); Michigan (Brevort, Grand Rapids, and Isle Royal); Minnesota (Grand Marais); Montana (Big Timber); New Hampshire (Franconia); New Jersey (Midland Park); New York (Ashokan Reservoir, Canajoharie, Chatham Center, Croton Reservoir, Dolgeville, Eagle Bridge, Farmingdale, Hancock, Herkimer, Hoosick Junction, Ithaca, Johnsonville, McLean, Middleburgh, North Blenheim, Oneonta, Oxford, Rome, Salisbury, and Trenton); Ontario (Ottawa); Oregon (Lebanon and Ontario); Utah (College Ward and Mills in Tooele County); and West Virginia (Webster Springs). The species seems to breed most abundantly in streams and rivers. Adults are on the wing throughout the growing season. They have been taken at Ithaca, N. Y., from May 5 to September 11. The earliest and latest dates of capture known to me are April 5 at Lebanon, Oreg., and October 25 at Washington, D. C.

117. *Tendipes (Limnochironomus) leucoscelis*, new species

Chironomus (Chironomus) sp. d, Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 61, 62; biology.

Male: Wing 2.6 mm. long; leg ratio 1.8; antennal ratio 2.5; frontal tubercles absent; pronotum above rather narrow, the mesoscutum projecting beyond it; front tarsus without a beard.

Pea green. Thorax with the sclerites pale orange and often with faint dusky markings; head and its appendages light brown; wing veins fuscous; wing membrane faintly infusate; halter knob light green; legs pea green except as follows: basal 0.7 of basitarsi white, the rest of the tarsi dark brown; front tibia and

apices of middle and hind tibiae brown; apical part of abdomen brownish. In two males from West Palm Beach, Fla., the basitarsi are entirely brown but with the basal 0.5 somewhat paler brown than the apical 0.5.

Genitalia: Figure 117. Similar to those of *T. (L.) lobiger* (fig. 115) and *T. (L.) fumidus* (fig. 116) in the large tip of the inferior appendage with rather irregularly placed hairs and in the short superior appendage, but differing from these parts in the narrower style and in details of the structure of other parts.

Female: Similar to the male except for the usual sexual differences.

Type: Male collected at the edge of an *Equisetum* marsh at the head of Coeur d'Alene Lake, Idaho, July 1, 1940, H. and M. Townes (Townes).

Paratypes: Thirty-three males, 14 females (including 15 males, 6 females, collected with the type) from Florida (West Palm Beach); Idaho (Coeur d'Alene Lake); Massachusetts (Holliston); Michigan (Carp Lake in Emmet County, Isabella County, and Osceola County); New Jersey (Atsion, Lenola and Medford Lakes); New York (Hudson River at Hudson); Ontario (Costello Lake in Algonquin Park); and Rhode Island (Westerly). Paratypes are in the collections of Townes, Harvard, Sabrosky, Dreisbach, Miller, and Cornell. Collection dates range from June 10 at Costello Lake, Ontario, to August 19 at Hudson, N. Y.

118. *Tendipes (Limnochironomus) californicus* (Johannsen),
new combination

Chironomus californicus Johannsen, 1905, Bull. N. Y. State Mus. 86:217; type locality: Pasadena, Calif. (Johannsen collection).

Male: Wing 2.7 mm. long; leg ratio 1.55; antennal ratio 2.3; frontal tubercles very small, thimble-shaped; pronotum of moderate width above, projecting slightly in front of the mesoscutum; fore tarsus without a beard.

Pruinose brown, the thorax with a very strong whitish-gray pruinosity. Wing veins pale brown; wing membrane with pale-gray spots in the bases of cells R_5 and Cu_1 and over vein 2A; halter knob whitish; legs stramineous, the bases and apices of femora and tibiae and the apical tarsal segments darker; abdomen somewhat paler at the incisures. Usually there is a subbasal brownish annulus on the femora.

Genitalia: Figure 118. Superior appendage expanded at the end as in *T. (L.) modestus* (fig. 119) and *T. (L.) neomodestus* (fig. 120), but the style broader and more weakly curved than in either of these.

Female: Similar to the male except for the usual sexual differences.

Material: Five males, 2 females, Los Angeles, Calif., June 11, 1940, R. F. Lewis (USNM); male, Fort Collins, Colo., August 6, 1935, Ralph Swain (Colo.); male, Elmer, Okla., July 6, 1937, Standish and Kaiser (Okla.); male, Grandfield, Okla., July 5, 1937, Standish and Kaiser (Townes); 2 males, 1 female, Ontario, Oreg., August 21, 1940, H. and M. Townes (Townes); male, female, Brownsville, Texas, May 9 and 17, 1904, H. S. Barber (USNM); 3 males, Devils River, Texas, July 2, 1917 (Cornell, Townes).

119. *Tendipes (Limnochironomus) modestus* (Say),
new combination

- Chironomus modestus* Say, 1823, Jour. Acad. Nat. Sci. Phila. 3:13 (Leconte Ed. 2: 41); type locality: Pennsylvania. (A fragment of a specimen determined by Say is in the Vienna Museum.)
Chironomus modestus Dyar, 1902, Proc. Ent. Soc. Wash. 5: 57; biology, description of larva and pupa.
Chironomus modestus Johannsen, 1905, Bull. N. Y. State Mus. 86: 227; description of larva, pupa, and adult.
Chironomus modestus McAtee, 1915, Science 42:695; biology.
Chironomus modestus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:476; description of larva, pupa, and adult.
Chironomus modestus Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:412; biology.
Cladopelma modestus Lenz, 1921, Deut. Ent. Ztschr. 1921:160; generic position.
Chironomus modestus Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. 14: 51, 65; biology.
Chironomus modestus Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15:421; biology.
Chironomus modestus Johannsen, 1926, Jour. N. Y. Ent. Soc. 34: 276; note on specimen determined by Say.
Chironomus modestus Bill, 1932, Psyche 39: 68; biology.
Chironomus (Limnochironomus) modestus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210: 43; description of larva and pupa.
Chironomus modestus Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 171; biology.

Male: Wing 2.8 mm. long; leg ratio 1.7; antennal ratio 2.6; frontal tubercles very small, thimble-shaped; pronotum narrow above, the mesonotum projecting beyond it; front tarsus without a beard.

Light green. Pedicel and thoracic sclerites marked with pale orange brown or rarely with dark brown or blackish; flagellum beyond the first segment and palpus brown; wing veins pale brown; halter knob white or greenish white; legs greenish stramineous, brownish toward their apices; abdomen brownish toward its apex.

Genitalia: Figure 119. The superior appendage is expanded at the end as in *T. (L.) californicus* (fig. 118) and *T. (L.) neomodestus* (fig. 120). The style is narrower than in *californicus* and broader than in *neomodestus*. Except for the broader apex to the superior appendage, the genitalia are very similar to those of *T. (L.) nervosus* (figs. 122A, 122B, and 122C).

Female: Similar to the male except for the usual sexual differences.

The original description of *C. modestus* fits a large number of species. I follow Johannsen and Malloch in the application of this name.

Material: Many males and a few females determined by association with their males from Albert (Edmonton and Gull Lake); District of Columbia (Washington); Florida (Biscayne Bay); Indiana (Indianapolis); Iowa (Davenport); Louisiana (Mound); Maryland (Dorchester County near Lloyds, High Island, Keswick, and Plummers Island); Massachusetts (Cambridge, Holliston, South Hadley, Woods Hole, and Worcester); Michigan (Detroit, East Lansing, Isabella County, Manistee County, Missaukee County, Nason County, Newaygo County, Nottawa County, Osceola County, and Traverse City); Minnesota (Anoka County, Mille Lacs Lake, Ramsey County, and St. Paul); New Jersey (Atsion, Medford Lakes, Riverton, and Westville); New

York (Babylon, Barrytown, Bemus Point, Camelot, Canajoharie, Chatham Center, Connecticut Hill in Tompkins County, Cornwall, Croton Reservoir, Farmingdale, Germantown, Glenida Lake, Hancock, Hudson, Ithaca, Mahopac Lake, Milford Center, Muscoto Reservoir, Otsego Lake, Peekskill, Poughkeepsie, Rhinecliff, Rome, Scarborough, Staatsburg, Syracuse, and Tarrytown); Ohio (Summit County); Ontario (Costello Lake in Algonquin Park and Ottawa); Oregon (Ontario); Quebec (Norway Bay and Stoneham); Rhode Island (Ashaway and Westerly); Virginia (Falls Church); and Washington (Mt. Rainier at 5,000 ft and Yelm). In the Northeast, this is the most abundant green species. Adults may be collected throughout the growing season. I have taken them in central New York from May 8 to September 12.

120. *Tendipes (Limnochironomus) neomodestus* (Malloch),
new combination

Chironomus tenellus Johannsen, 1905, Bull. N. Y. State Mus. 86:214; description of larva and pupa, misdetermination of *tenellus* Zetterstedt.

Chironomus neomodestus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:475; type locality: St. Joseph, Ill. (Ill.).

Chironomus (Limnochironomus) fumidus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:44; description of larva and pupa, misdetermination of *fumidus* Johannsen.

Male: Wing 2.2 mm. long; leg ratio 1.7; antennal ratio 2.6; frontal tubercles very small, thimble-shaped; pronotum narrow above, the mesoscutum projecting beyond it; fore tarsus without a beard.

Head and thorax dark brown and strongly pruinose; abdomen dark brown tinged with olive green. Wing veins pale brown; wing membrane with indefinite gray spots in the bases of cells R_5 and Cu_1 and over vein 2A; halter knob whitish to pale brown; legs beyond coxae pale brown, darker toward their apices and at the apices of the femora and tibiae.

Genitalia: Figure 120. Superior appendage expanded at the end as in *T. (L.) californicus* (fig. 118) and *T. (L.) modestus* (fig. 119), but the style narrower and more strongly curved than in either of these.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and females from the District of Columbia (Washington); Illinois (Algonquin); Indiana (Indianapolis); Iowa (Davenport); Kansas (Lawrence and Manhattan); Maryland (Plummers Island); Michigan (Cheboygan, East Lansing, and Midland County); Missouri (Atherton); New Jersey (Riverton); New York (Canajoharie, Castle Point, Cornwall, Croton Reservoir, East Aurora, Fonda, Germantown, Hancock, Hyde Park, Ithaca, Mecklenburg, North Petersburg, Poughkeepsie, Rhinecliff, and Staatsburg); Ontario (Fort Erie); Pennsylvania (Philadelphia); Quebec (Aylmer); Rhode Island (Westerly); South Carolina (Greenville); South Dakota (Mitchell); and Virginia (Falls Church and Maywood in Alexandria County). Adults are common throughout the summer. They have been collected from May 5 at Davenport, Iowa, to September 12 at Ithaca, N. Y.

121. *Tendipes (Limnochironomus) aethiops*, new species

Male: Wing 2.1 mm. long; leg ratio 1.53; antennal ratio 2.2; frontal tubercles apparently absent; pronotum of moderate width above, projecting slightly in front of the mesoscutum; front tarsus without a beard.

Head and thorax dark brown and strongly pruinose; abdomen dark brown

tinged with olive green. Wing veins pale brown; wing membrane with pale-gray indefinite spots in the bases of cells R_5 and Cu_1 and over vein 2A; halter knob whitish; legs beyond coxae pale brown, darker toward their apices and at the knees and apices of the tibiae.

Genitalia: Figure 121, drawn from the type. Rather similar to those of *T. (L.) nervosus* (figs. 122A, 122B, and 122C) and *T. (L.) botaurus* (fig. 123) but distinct in the shape of the superior appendage.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Las Vegas Hot Springs, N. Mex., August 13, 1901, H. S. Barber (USNM).

Paratypes: Seven males, 10 females, Las Vegas Hot Springs, N. Mex., August 7, 8, 11, 12, 13, 14, 15, 16, and 19, 1901, H. S. Barber (USNM, Townes).

122. TENDIPES (LIMNOCHIRONOMUS) NERVOSUS (Staeger)

Chironomus nervosus Staeger, 1839, Naturh. Tidsskr. 2:567; type locality: ?Denmark (?Copenhagen museum). This reference not seen.

Chironomus modestus var. a, Johannsen, 1905, Bull. N. Y. State Mus. 86:228; description of larva, pupa, and adult.

Chironomus lucifer Johannsen, 1907, Kans. Univ. Sci. Bull. 4: 110; type locality: bridge crossing Kansas River at Lawrence, Kans. (A male in the Kansas collection is hereby made lectotype.) New synonymy.

Chironomus indistinctus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:477; type locality: St. Joseph, Ill. (Ill.); description of pupa and adult. New synonymy.

Chironomus tritomus Kieffer, 1916, Arch. Hydrobiol. Suppl. 2:524; type locality: shore of Lake Vetter, Jönköping, Sweden (location of type unknown). New synonymy.

Chironomus (Limnochironomus) nervosus Goetghebuer, 1928, Faune de France 18:52; description, generic position.

Tendipes (Limnochironomus) nervosus Kruseman, 1933, Tijdschr. Ent. 76:176; description, generic position.

Chironomus (Limnochironomus) indistinctus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:44; description of larva and pupa.

Chironomus nervosus Fellton, 1940, Jour. Econ. Ent. 33:252-263; biology.

Chironomus (Chironomus) lucifer (*Limnochironomus* group) Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:20, 44, 61, 63; biology.

Male: Wing 2.8 mm. long; leg ratio 1.6; antennal ratio 2.6; frontal tubercles very small, thimble-shaped; pronotum narrow above, the mesoscutum projecting beyond it; front tarsus without a beard.

Pale green. Head and thorax marked with pale orange brown or rarely with dark brown; flagellum beyond the first segment and palpus brown; wing veins pale brown; halter knob white or greenish white; legs greenish stramineous, brownish toward their apices; abdomen brownish toward its apex.

Genitalia: Figures 122A, 122B, and 122C. Similar to those of *T. (L.) modestus* (fig. 119), *T. (L.) aethiops* (fig. 121), and *T. (L.) botaurus* (fig. 123) but distinct in the shape of the superior appendage. The superior appendage varies between the three types figured, figure 122A being considered more nearly typical.

Female: Similar to the male except for the usual sexual differences.

There are two varieties of this species that seem worthy of note. One is darker in color than normal with the apical part of the abdomen dark brownish and the superior appendage narrow as in figure 122B. This variety is very common and is generally more southern in distribution than the typical variety. The types of *Chironomus lucifer* Joh., of *Chironomus indistinctus* Mall., and apparently also the type of *Chironomus tritomus* Kf. belong to this variety. The second variety has the abdomen dark fuscous green with the incisures paler so that the abdomen appears banded. The genitalia do not differ from those of the typical variety. I have seen seven males of this from Steamboat and Reno, Nev. (USNM, Townes). Nearctic material of this species has been compared with a male and female of *T. tritomus* (Kieffer) and a series of five males and four females of *T. nervosus* (Staeger) in the United States National Museum, all from England and determined by Edwards.

Material: Many males and a few females determined by association with their males from Alberta (Wabamun); Arkansas (Galloway); California (Lake Tahoe); District of Columbia (Washington); Florida (West Palm Beach); Iowa (Madsen's Point); Louisiana (Mound); Manitoba (Churchill); Massachusetts (Chicopee and South Hadley); Michigan (Isabella County, Manistee County, Mason County, Midland County, and Nottawa); Minnesota (Ft. Snelling, Hennepin County near Shakopee, Ramsey County, and St. Paul); Missouri (Atherton); Montana (Big Timber and Glasgow); Nevada (Reno and Steamboat); New Jersey (Camden and Riverton); New York (Canajoharie, Croton Point, Croton Reservoir, Farmingdale, Flushing, Freeville, Hancock, Haverstraw, Hudson, Hyde Park, Ithaca, Kingston, Millwood, Otsego Lake, Peekskill, Poughkeepsie, Rhinecliff, Scarborough, Staatsburg, Syracuse, and Tarrytown); Oklahoma (Chickasha); Ontario (Ottawa and Rockport); Oregon (Independence and Takenitch Lake); Quebec (Norway Bay); Saskatchewan (Attons Lake at Cut Knife and Cream Lake); South Dakota (Mitchell); Texas (Sugar Land and Brownsville); Virginia (Great Falls); Washington (Lake Cushman and Mt. Rainier at 3,500 ft.); and Wyoming (Meadow Lake in the Bighorn Mountains at 8,000 ft.). Adults are common throughout the growing season. In central New York they have been collected from May 8 to September and at Washington, D. C., as late as October 11. This species is widespread and common in Europe.

123. *Tendipes (Limnochironomus) botaurus*, new species

Male: Wing 2.6 mm. long; leg ratio 1.6; antennal ratio 2.6; frontal tubercles not visible in the specimens before me; pronotum of moderate width above, with a narrow median cleft almost as distinct as that of *Xenochironomus xenolabis*; front tarsus without a beard.

Dark pea green, the thorax pruinose and with light orange-brown markings. Antenna and mouthparts light brown; wing veins pale brown; halter knob greenish white; legs pale green passing into brown at their apices.

Genitalia: Figure 123, drawn from the type. Rather similar to those of *T. (L.) aethiops* (fig. 121) and *T. (L.) nervosus* (figs. 122A, 122B, and 122C) but the superior appendage incurved at the tip and ending in a point.

Female: Unknown.

Type: Male, Big Timber, Mont., July 14, 1917, H. G. Dyar (USNM).

Paratype: Male, Brevort, Mich., August 2, 1936, C. W. Sabrosky (Townes).

124. *Tendipes (Limnochironomus) milleri*, new species

Chironomus (Limnochironomus) sp. c, Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 61, 62; biology.

Male: Wing 2.3 mm. long; leg ratio 1.8; antennal ratio 2.8; frontal tubercles very small, thimble-shaped; pronotum narrow above, the mesoscutum projecting beyond it; fore tarsus without a beard.

Pale green. Antenna and mouthparts light brown; thoracic markings greenish pale brown; wing veins pale brown; halter knob greenish white; legs pale green, the fore tibia and tarsus and the apical tarsal segments of the middle and hind legs pale brown.

Genitalia: Figure 124. The extremely long and strongly curved style is distinctive.

Female: Unknown.

Type: Male, Bemus Point, N. Y., July 24, 1937, H. K. Townes (Townes).

Paratypes: Three males, Missaukee County, Mich., May 29, 1939, R. R. Dreisbach (Dreisbach, Townes); male, Ithaca, N. Y., September (Cornell); 3 males, Costello Lake in Algonquin Park, Ontario, August 11, 14, and 16, 1937, R. B. Miller (Miller, Townes); male, Takenitch Lake, Oreg., August 5, 1940, H. K. Townes (Townes).

Subgenus KIEFFERULUS

Kiefferulus Goetghebuer, 1922, Ann. Biol. Lacustre 11:40. Genotype: *Tanytarsus tendipediformis* Goetghebuer (monobasic and original designation).

Frontal tubercles absent; pronotum uniformly narrowed towards the center, not produced or notched medially, even with or slightly surpassed by the anterior end of the mesoscutum; fork of Cu slightly beyond r-m; tarsal beard absent; wing membrane with a few macrotrichia in the genotype, but bare in the Nearctic species.

Male genitalia: Superior appendage horn-shaped, strongly curved, and without setae beyond its base; inferior appendage large, oval, broad, and flat. See figures 125A and 125B.

125. *Tendipes (Kiefferulus) dux* (Johannsen), new combination

Chironomus dux Johannsen, 1905, Bull. N. Y. State Mus. 86: 231; type locality: Ithaca, N. Y. (Johannsen collection); description of larva, pupa, and adult.

Chironomus obscurulus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 479; type locality: Dubois, Ill. (Ill.). New synonymy.

Cladopelma dux Lenz, 1921, Deutsche Ent. Ztschr. 1921: 160; generic position.

Chironomus dux Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. **14**: 56; biology.
Chironomus dux Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. **15**: 422; biology.
Chironomus (Einfeldia) dux Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**: 45; description of larva and pupa.

Male: Wing 3.5 mm. long; leg ratio 1.55; antennal ratio 3.0; frontal tubercles absent; wing membrane without macrotrichia; fore tarsus without a beard.

Pale green. Pedicel and thoracic markings ochraceous; flagellum and palpus except at their bases brown; legs pale green, brown at their apices; apical part of abdomen brownish.

Genitalia: Figures 125A and 125B. Most of the apparent differences between the two genitalia figured are due to differences in position.

Female: Similar to the male except for the usual sexual differences.

This species varies considerably in size, leg ratio, and shape of genital appendages.

Material: Many males and females from Florida (Monticello and St. Augustine); Idaho (Cataldo); Iowa (Davenport); Indiana (La Fayette); Louisiana (Mound); Michigan (Midland County); Minnesota (Crookston and Houston County); Missouri (Atherton and St. Louis); New Jersey (Moorestown and Westville); New York (Amsterdam, Canajoharie, Hudson, Ithaca, Kinderhook, Lake Sebago in Bear Mountain State Park, Niskayuna, South Trenton, and Tuxedo); Ohio (Summit County); Ontario (Lake Opeongo); Oregon (Independence); and Rhode Island (Westerly). Adults have been collected from March 20 at Monticello, Fla. and April 20 at Atherton, Mo., to October at Atherton, Mo.

Subgenus EINFELDIA

Einfeldia Kieffer, 1924, Ann. Soc. Sci. Bruxelles **43**, c. r.: 393. Genotype: *Einfeldia pectoralis* Kieffer (monobasic).

Frontal tubercles present or perhaps sometimes absent; pronotum narrowed medially and with a broad weak median notch, slightly surpassed by the anterior end of the mesoscutum; fork of Cu somewhat beyond r-m; tarsal beard short or lacking.

Male genitalia: Superior appendage horn-shaped, without setae, and with an abruptly expanded large setiferous base; inferior appendage club-shaped. See figures 126 to 129.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS EINFELDIA

1. Halter knob brown; body entirely blackish brown; frontal tubercles large 126. *brunneipennis* (Johannsen)
 Halter knob pale; body entirely or largely greenish; frontal tubercles minute (or sometimes absent?) 2
2. Basal abdominal tergites each with a broad transverse brown band that leaves only a narrow basal and apical band of green 127. *dorsalis* (Meigen)
 Basal abdominal tergites uniformly green 3
3. Anal point of male genitalia broad; style inflated and abruptly constricted before its apex (fig. 128); wing about 3.8 mm. long 128. *paganus* (Meigen)
 Anal point of male genitalia narrower; style neither inflated nor abruptly constricted (fig. 129); wing about 2.4 mm. long 129. *chelonina*, new species

126. *Tendipes (Einfeldia) brunneipennis* (Johannsen),
new combination

Chironomus brunneipennis Johannsen, 1905, Bull. N. Y. State Mus. 86:205; type locality: Ithaca, N. Y. (Johannsen collection).

Male: Wing 3.0 mm. long; leg ratio 1.7; antennal ratio 2.8; frontal tubercles large; front tarsus without a beard.

Blackish brown. Halter knob and wing veins brown; base of fore femur, tibiae except bases and apices, and basitarsi except apices ochraceous brown.

Genitalia: Figure 126. The small basal part of the superior appendage is distinctive.

Female: Similar to the male except for the usual sexual differences.

This species is similar to the European *T. dissidens* (Walker) except in the shape of the superior appendage and of the ninth tergite of the male genitalia.

Material: Many males and females from Arkansas (Galloway); Florida (Orlando and West Palm Beach); Iowa (Davenport); Massachusetts (Amherst); Michigan (Manistee County and Midland County); Minnesota (Cass Lake, New Brighton, and Nisswa); New Jersey (Moorestown); New York (Bemus Point, Buffalo, Ithaca, Mayville, Millford Center, Millwood, and Peekskill); and North Carolina (Raleigh). Adults occur throughout the growing season. They have been collected at Ithaca, N. Y. from May to September 12.

127. *Tendipes (Einfeldia) dorsalis* (Meigen),
new combination

Chironomus dorsalis Meigen, 1818, System. Besch. europ. zweifl. Ins. 1: 25; type locality: ?France (Paris museum).

Chironomus longipes Staeger, 1839, Naturh. Tidsskr. 2: 570; type locality: Denmark (? Copenhagen museum). New synonymy.

Tendipes dorsalis Kieffer, 1911, Bull. Soc. d'Hist. Nat. Metz 27:34, 39; generic position.

Male: Wing 3.2 mm. long; leg ratio 1.7; antennal ratio 3.0; frontal tubercles minute; fore tarsus without a beard.

Pale green. Pedicel and thoracic markings ochraceous; flagellum except base and palpus brown; tarsi mostly stramineous with most of the apical segments brown; abdominal tergites each with a central brown mark which covers all except its base and apex, the apical tergites entirely brown; genitalia brown.

Genitalia: Figure 127.

Female: Similar to the male except for the usual sexual differences.

Edwards (1929, Trans. Ent. Soc. London 77:385) stated that the specimen in Meigen's collection labeled *Chironomus dorsalis* belongs to this species, but believed that Meigen's description of *C. dorsalis* fits *Tendipes (T.) riparius* better than it does the present species, and applied the name *dorsalis* to *riparius*. I can not agree that Meigen's description fits *riparius* better than the

present species. Nearctic material has been compared with a series of five males and one female from England, determined as *Chironomus longipes* by Edwards.

Material: Many males and females from Florida (West Palm Beach); Idaho (Coeur d'Alene Lake); Iowa (Davenport); Massachusetts (Worcester); Missouri (Atherton and St. Louis); New Jersey (Atsion, Medford Lakes, Moorestown, and Westville); New York (Buffalo, Canadarago Lake, Canajoharie, Hudson, Ithaca, Niskayuna, Oneonta, Otsego Lake, and Ringwood in Tompkins County); North Carolina (Raleigh); Ohio (Summit County); and Rhode Island (Westerly). Adults occur throughout the growing season. They have been collected from April 29 at Atherton, Mo., to August 23 at Niskayuna, N. Y.

128. TENDIPES (EINFELDIA) PAGANUS (Meigen)

Chironomus paganus Meigen, 1838, System. Besch. europ. zweifl. Ins. 7: 7; type locality; region of Liège (Belgium) (?Paris museum).

Tendipes (Phylochironomus) paganus Kruseman, 1933, Tijdschr. Ent. 76:173; description, generic position.

Tendipes (Einfeldia) paganus Goetghebuer, 1937, in Lindner: Die Fliegen der palaearktischen Region 13c: 31; description, generic position.

Male: Wing 3.8 mm. long; leg ratio 1.4; antennal ratio 3.2; frontal tubercles minute; fore tarsus with a rather short beard.

Light pea green. Flagellus except at its base and palpus dark brown; pedicel and thoracic markings ochraceous, or sometimes brown or black; legs green, brown towards their apices; genitalia light brown.

Genitalia: Figure 128. The inflated style abruptly constricted near the apex and the broad anal point are distinctive.

Female: The pedicel and thoracic markings are never darker than pale brown. Otherwise similar to the male except for the usual sexual differences.

I have compared Nearctic material with a series of five males and one female from England, determined by Edwards.

Material: Male, Cataldo, Idaho, July 1, 1940, H. and M. Townes (Townes); male, Isabella County, Mich., June 9, 1940, R. R. Dreisbach (Dreisbach); 3 males, Canadarago Lake, N. Y., June 21, 1935, H. K. Townes (Townes); 2 males, Milford Center, N. Y., July 17, 1935, H. K. Townes (Townes); 4 males, 4 females, Otsego Lake, N. Y., June 19, 1935, June 25, 1935, July 18, 1935, and August 22, 1935, H. K. Townes (Townes, Harvard); 3 males, 2 females, Waubay, S. Dak., June 6, 1918 (USNM); and 101 males and females in the Rempel collection from Canadarago Lake, Milford Center, and Otsego Lake, N. Y., collected from June 19, 1935, to September 3, 1935, by H. K. Townes.

This species was very abundant at Otsego Lake, N. Y., about June 19, 1935. Specimens could be collected with a net by the cupful. In some places the bushes were so thick with them that when a specimen alighted, others had to move over to make room for it. At this time most of the male specimens had brown or black thoracic markings. At the same time, specimens collected at the nearby and warmer Canadarago and Goodyear lakes all had ochraceous markings. By July 1, no specimens with dark markings could be found at Otsego Lake, but they occurred again in a small percentage of the specimens taken at Otsego Lake in late August.

129. *Tendipes (Einfeldia) chelonia*, new species

Male: Wing 2.4 mm. long; leg ratio 1.3; antennal ratio 2.6; frontal tubercles not observable in the specimens before me; fore tarsus with a very short and sparse beard.

Pale green. Pedicel and thorax ochraceous; flagellum except at its base and palpus except at its base pale brown; legs pale green, brown towards their apices.

Genitalia: Figure 129, drawn from the type.

Female: Unknown.

Type: Male, Canajoharie, N. Y., July 7, 1934, H. K. Townes (Townes).

Paratypes: Male, Washington, D. C., June 12, 1912, W. L. McAtee (USNM); male, Riverton, N. J., June 5, 1939, H. K. Townes (Townes); male, Canajoharie, N. Y., July 16, 1934, H. K. Townes (Townes); 4 males, Poughkeepsie, N. Y., June 22, 1936, H. K. Townes (Townes).

Chaetolabis, new subgenus

Genotype: *Tendipes (Chaetolabis) atroviridis*, new species.

Frontal tubercles present; pronotum somewhat narrowed towards the center but medially somewhat produced, sometimes with a broad weak median notch, slightly surpassed by the anterior end of the mesoscutum; fork of Cu under r-m; tarsal beard lacking; body polished, not pruinose.

Male genitalia: Superior appendage broad, sclerotized, and with many setae arising from its under surface; inferior appendage spatulate. See figures 130 and 131.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS CHAETOLABIS

1. Fore basitarsus blackish brown in its apical 0.1, the rest pale brown; lateral mesoscutal stripes usually fuscous brown; superior appendage of male genitalia lanceolate (fig. 130) 130. *atroviridis*, new species
- Fore basitarsus entirely blackish brown; lateral mesoscutal stripes ochraceous; superior appendage of male genitalia capitate (fig. 131) 131. *ochreateus*, new species

130. *Tendipes (Chaetolabis) atroviridis*, new species

Chironomus viridicollis Johannsen, 1905, Bull. N. Y. State Mus. 86:232; description; misdetermination of *viridicollis* Wulp.

Chironomus viridicollis Needham, 1908, in Hankinson: A Biological Survey of Walnut Lake, Mich., pp. 257-258; biology; figure of larval mouthparts; misdetermination of *viridicollis* Wulp.

?*Chironomus viridicollis* Branch, 1931, Trans. Kans. Acad. Sci. 34: 154; description of eggs and larva.

Chironomus near *viridicollis* Townes, 1937, Ann. Rpt. N. Y. State Conservation Dept. 26, suppl.: 221, 222; biology, description of larva.

Chironomus (Einfeldia) "viridicollis" Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:21, 45; description.

Male: Wing 5.0 mm. long; leg ratio 1.55; antennal ratio 4.0; frontal tubercles small, but rather long; fore tarsus without a beard.

Head brown, the clypeus and appendages dark brown; mesoscutal vittae and posterior part of the postnotum dark brown, the median mesoscutal vitta divided by a pale line; rest of thorax ochraceous with ochraceous-brown markings, slightly tinged with green; anterior wing veins brown, the rest pale; vein r-m somewhat darkened; halter knob greenish; legs greenish, grading to brown on the apical tarsal segments and with the following dark-brown markings: Extreme apices of femora, base and apex of all tibiae but broader on the fore tibia, apex of basitarsi, and base and apex of second tarsal segments; third, fourth, and fifth tarsal segments dark brown; abdomen blackish green, the basal part more or less green. The fore tibia is sometimes entirely blackish brown.

Genitalia: Figure 130, drawn from the type. The shape of the superior appendage is distinctive.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Bemus Point, N. Y., July 10, 1937, H. K. Townes (Townes).

Paratypes: Seventy-three males, 37 females, from British Columbia (Terrace); Connecticut (Stafford); District of Columbia (Washington); Idaho (Cataldo); Illinois (Urbana); Iowa (Crystal Lake at Davenport and Dickinson County); Massachusetts (Amherst, Edgartown, Holliston, and Wellesley); Michigan (East Lansing, Iosco County, Manistee County, Nottawa, and Silver Lake in Oceana County); Minnesota (Cass Lake, Chisago County, Crystal Lake, Hennepin County, and Mendota in Dakota County); New York (Amsterdam, Bemus Point, Canandarago Lake, Ithaca, Mayville, Otsego Lake, Ringwood in Tompkins County, Round Island, and Tuxedo); Ohio (Summit County); Ontario (Orillia and Point Pelee); Saskatchewan (Oxbow); and Virginia (Dyke and Falls Church). Paratypes are in the collections of Townes, Rempel, United States National Museum, Cornell, Sabrosky, Minnesota, Canadian National Collection, Dreisbach, Harvard, Massachusetts, Hauber, Kansas, and American Museum. This species seems to breed only in lakes. Adults occur throughout the growing season. They have been collected from May 5 at East Lansing, Mich., to October 3 at Urbana, Ill.

131. *Tendipes (Chaetolabis) ochreatus*, new species

Male: Wing 3.9 mm. long; leg ratio 1.7; antennal ratio 3.9; frontal tubercles very small, subspherical; fore tarsus without a beard.

Head ochraceous; pedicel brownish ochraceous; flagellum except base and palpus brown; thorax ochraceous; mesosternum and mesoscutal vittae brownish ochraceous; posterior part of postnotum brown; wing veins brown, the anterior ones darker; halter knob ochraceous; legs ochraceous; apex of fore femur and entire fore tibia and tarsus dark brown; middle and hind tarsi dark brown

except towards the base; abdomen blackish brown, the basal segment mostly ochraceous.

Genitalia: Figure 131. The shape of the superior appendage is distinctive.

Female: Median mesoscutal vitta dark brown and divided longitudinally by a pale line. Otherwise similar to the male except for the usual sexual differences.

Type: Male, Medford Lakes, N. J., June 3, 1939, H. K. Townes (Townes).

Paratypes: Three males, Galloway, Ark., August 28, 1940, H. K. Townes (Townes); 2 males, Lincoln County, Maine, July 5, 1940 and July 10, 1938, D. J. Borrow (Ohio); male, Holliston, Mass., August 9, N. Banks (Harvard); male, Empire, Mich., June 23, 1937, C. W. Sabrosky (Sabrosky); female, Chesilhurst, N. J., June 25, 1939, H. K. Townes (Townes); male, female, Glassboro, N. J., July 19, 1942, and August 12, 1942, W. F. Rapp, Jr. (USNM); 2 males, 1 female, Lake Sebago, Bear Mountain State Park, N. Y., July 28, 1936, and August 9, 1936, H. K. Townes (Townes); female, Westerly, R. I., August 15, 1936, M. C. Townes (Townes); male, Wickford, R. I., June 9, 1914, C. W. Johnson (Harvard); female, Greenville, S. C., September 2, 1940, H. K. Townes (Townes); male, female, Table Rock State Park, Pickens County, S. C., September 1, 1939, H. K. Townes (Townes); male, Four-mile Run, Va., May 31, 1914, W. L. McAtee (Ill.); and male, Norfolk County, Va., May 11, 1928, G. E. Gould (Kans.).

Subgenus TENDIPES

Tendipes Meigen, 1800, *Nouv. Class. des Mouches à deux Ailes*, p. 17. Genotype: *Tipula plumosa* Linnaeus (designated by Coquillett, 1910, *Proc. U. S. Nat. Mus.* 37: 612).

Chironomus Meigen, 1803, *Mag. f. Insektenk.* (Illiger) 2:260. Genotype: *Tipula plumosa* Linnaeus (designated by Latreille, 1810, *Consid. Général.*, p. 442).

Camptochironomus Kieffer, 1918, *Ent. Mitteil.* 7:45. Genotype: (*Chironomus* (*Camptochironomus*) *subaprilinus* Kieffer) = *tentans* (Fabricius) (the only species originally included with certainty). New synonymy.

Clinochironomus Kieffer, 1921, *Ann. Soc. Sci. Bruxelles* 40, c. r.: 272; 40, mém: 281. Genotype: *Clinochironomus vulpinus* Kieffer (monobasic).

Syntendipes Lenz, 1937, *Arch. Hydrobiol. Suppl.* 15: 6. Genotype: *Chironomus flavitibia* Johannsen (monobasic). New synonymy.

Stictotendipes Lenz, 1937, *Arch. Hydrobiol. Suppl.* 15: 8. Genotype: *Chironomus stupidus* Johannsen (monobasic). New synonymy.

Frontal tubercles usually present (fig. 260); pronotum somewhat narrowed towards the center but usually with the central part produced so that the anterior margin is concave on each side, with a broad weak median notch, approximately even with the anterior end of the mesoscutum (figs. 232 and 239); fork of Cu under or beyond r-m; tarsal beard present or absent.

Male genitalia: Superior appendage horn-shaped, lanceolate, or foot-shaped; inferior appendage spatulate. See figures 132 to 151.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS TENDIPEX

1. Abdominal segments 2 to 5 entirely green or greenish 2
 Abdominal segments 2 to 5 banded with brown, or entirely dark brown or black.... 4
2. Wing about 5.5 mm. long.....149. *plumosus* (Linnaeus) variety.
 Wing about 2.7 mm. long 3
3. Anal point narrow; style abruptly narrowed to a submucronate tip (fig. 133)....
 133. *fulvipilus* (Rempel)
 Anal point broad; style slightly narrowed to a rounded tip (fig. 134).....
 134. *pungens*, new species
4. Mesoscutum light brown, marked with three velvety black spots on each side;
 anal point narrow (fig. 132).....132. *carus*, new species
 Mesoscutum not marked as above, more uniformly colored; anal point usually
 broad (figs. 135 to 151) 5
5. Wing 4.8 to 7.5 mm. long, and the abdomen with distinct transverse bands of
 light and dark color that are not entirely due to differences in pruinosity..... 6
 Wing 3.0 to 6.4 mm. long, if more than 4.8 mm. long, then the abdomen entirely
 blackish except for pruinosity 9
6. Style and coxite of male genitalia usually large and heavy (figs. 150 and 151).... 7
 Style and coxite of male genitalia of more normal proportions (figs. 146 and 149) .. 8
7. Superior appendage large, not concealed beneath the ninth tergite; style shorter
 (fig. 150)150. *crassicaudatus* (Malloch)
 Superior appendage small and concealed beneath the ninth tergite; style longer
 (fig. 151)151. *tentans* (Fabricius)
8. Style unusually narrow (fig. 149); fore tarsus of male with a long beard, the
 longer hairs of which diverge from the tarsus at more than 60°; leg ratio about
 1.2; wing about 5.9 mm. long; dark bands on abdomen usually medium brown
 149. *plumosus* (Linnaeus)
 Style broader (fig. 146); fore tarsus of male with a short beard, the longer hairs
 of which diverge from the tarsus at about 45°; leg ratio about 1.35; wing
 about 5.7 mm. long; dark bands on abdomen blackish brown.....
 146. *stacgeri* (Lundbeck)
9. Fore tarsus of male without a beard, or in *decorus* rarely with a short beard.....10
 Fore tarsus of male with a distinct beard, which is long and sparse in *atrella*
 and *anthracinus*, rather short and moderately dense in *decumbens*, and long
 and dense in the rest of the species.....14
10. Anal point of male genitalia narrow at base, not flat above; superior appendage
 broad at the apex (fig. 139).....139. *riparius* (Meigen)
 Anal point of male genitalia broad at the base, flat above; superior appendage
 horn-shaped, pointed at the apex.....11
11. Abdominal tergites 2 to 5 pale, each with a brown band which often covers
 nearly all of the tergite.....136. *decorus* (Johannsen)
 Abdominal tergites 2 to 5 entirely blackish, but each with a more or less distinct
 apical pruinosous band.....12
12. Wing about 3.4 mm. long; leg ratio 1.55 to 1.7.....137. *tuxis* (Curran)
 Wing about 5.4 mm. long; leg ratio 1.2 to 1.5.....13
13. Clypeus very large, larger than the pedicel of the male.....148. *atritibia* (Malloch)
 Clypeus of moderate size, smaller than the pedicel of the male.....
 142. *biseta*, new species
14. Coloration pale brownish cinereous; central wider portion of pronotum unusually
 wide and abruptly produced135. *stigmaterus* (Say)
 Coloration blackish; central wider portion of pronotum not unusually wide.....15
15. Clypeus very large, its width greater than the diameter of the pedicel of the
 male; fore tarsus of male with a long sparse beard.....147. *anthracinus* (Zetterstedt)
 Clypeus of normal size, its width less than the diameter of the pedicel of the
 male16

16. Leg ratio about 0.98; beard of male fore tarsus long and very dense.....145. *pilicornis* (Fabricius)
 Leg ratio about 1.10 to 1.4; beard of male fore tarsus sparse to dense.....17
17. Longer hairs in beard of fore tarsus about 4.0 as long as the diameter of the tibia, arising at an angle of about 45°.....140. *decumbens* (Malloch)
 Longer hairs in beard of fore tarsus about 6.0 as long as the diameter of the tibia or longer, arising at an angle of about 60° to 70°.....18
18. Beard on fore tarsus of male sparse; leg ratio about 1.35; antennal ratio about 3.9; wing about 4.1 mm. long.....138. *atrella*, new species
 Beard on fore tarsus of male dense; leg ratio about 1.1 to 1.3; antennal ratio about 3.7 to 6.5; wing about 4.6 mm. long.....19
19. Anal point very broad and short (fig. 143), the apical half more or less amber colored; mesoscutal tubercle small or absent.....143. *utahensis* (Malloch)
 Anal point not unusually broad (figs. 141 and 144), entirely black.....20
20. Mesoscutum with a prominent median tubercle (at the posterior end of the median vitta); leg ratio about 1.15.....144. *tuberculatus*, new species
 Mesoscutum without a median tubercle; leg ratio about 1.26.....141. *hyperboreus* (Staeger)

132. *Tendipes* (*Tendipes*) *carus*, new species

Male: Wing 3.1 mm. long; leg ratio 1.25; antennal ratio 3.8; body of medium build; frontal tubercles absent; clypeus very small; pronotum slightly narrowed in the middle; fore tarsus with a short beard.

Ground color ochraceous more or less tinged with green or brown. Pedicel and clypeus ochraceous; flagellum light brown; mesoscutum with a cinereous brown band around the edge just above which are three velvety-black subtriangular spots on each side, the most anterior spot the largest and the most posterior spot the smallest; base of pronotum infuscate; wing veins pale brown; vein r-m not darkened; apices of femora, tibiae, and tarsal segments light brown; apical tarsal segments brown; abdominal tergites 2 to 7 each with a more or less distinct central rhomboidal brown patch.

Genitalia: Figure 132. The narrow anal point and expanded superior appendage are noteworthy.

Female: Similar to the male except for the usual sexual differences.

The mesoscutal markings of this species make it easy to recognize.

Type: Male, La Mucuy, Merida, Venezuela, July 1938, P. J. Anduze (Townes).

Paratypes: Two males, 1 female, collected with the type (Townes); 9 males, 2 females, Barro Colorado Island, Canal Zone, December 25, 1928, December 29, 1928, and January 7, 1929, C. H. Curran (Amer. Mus.); 11 males, 31 females, Barro Colorado Island, Canal Zone, April 1940, May 23 and 24, 1941, and July 1941, James Zetek (USNM); 2 females, Gatun, Canal Zone, July 3, 1913, James Zetek (USNM); female, Baranquilla, Colombia, 1941, C. L. Fagan (USNM); 2 females, Buenaventura, Colombia, 1941, C. L. Fagan (USNM); 2 females, Tempisque, Costa Rica, 1931, A. Alfaro (USNM); male, Brownsville, Tex., June 11 to 16, 1933, Darlington (Harvard); female, Cedar Lane, Tex., August 9, 1928, R. H. Beamer

(Kans.); 2 females, Galveston, Tex., May, F. H. Snow (Cornell); female, San Antonio, Tex., August 26, 1914 (USNM); male, no data (Cornell).

133. *Tendipes (Tendipes) fulvipilus* (Rempel), new combination

Chironomus fulvipilus Rempel, 1939, Zool. Anz. 127:210; type locality: Bonito, Parahyba, Brazil (Rempel).

Male: Wing 2.7 mm. long; leg ratio 1.65; antennal ratio 2.4; body slender; frontal tubercles small; clypeus very small; middle portion of pronotum hardly at all widened; fore tarsus without a beard.

Pale green. Pedicel, clypeus, and mouthparts brownish ochraceous; flagellum light brown; thoracic markings ochraceous; wing veins light brown, vein r-m not darkened; apex of fore femur, apex and basal half of fore tibia, and tarsi except the basal part of the middle and hind tarsi brown.

Genitalia: Figure 133. The narrow anal point together with the shape of the style make this species easy to recognize.

Female: Similar to the male except for the usual sexual differences.

This species and the following are our only small green species of the subgenus. The two are easily separated on genitalia. Professor Rempel has compared specimens with his type for me.

Material: Two males, San Jose, Costa Rica, H. S. Schmidt (USNM); 3 males, 2 females, St. Augustine, Fla., April 14, 1919, C. W. Johnson (Harvard, Townes); 16 males, 6 females, West Palm Beach, Fla., September 20, 1942, September 22, 1942, September 29, 1942, October 5, 1942, and October 31, 1942, D. E. Hardy (USNM, Rempel); 2 males, Berlin, Md., September 20, 1933, F. C. Bishopp (USNM); and male, Sugar Land, Tex., September 7, 1937, Christensen and Clancey (USNM).

134. *Tendipes (Tendipes) pungens*, new species

Male: Wing 2.7 mm. long; leg ratio 1.65; antennal ratio 2.9; body of medium build; frontal tubercles extremely small; clypeus very small; middle portion of pronotum slightly widened; fore tarsus without a beard.

Pea green. Pedicel and thoracic markings ochraceous; flagellum brown; wing veins brownish, vein r-m not darkened; femora and middle and hind tibiae green; tarsi and fore tibia light brown, paler in the middle of the fore tibia and towards the bases of the tarsi.

Genitalia: Figure 134, drawn from the type. The very broad and anal point and very slender superior appendage are distinctive.

Female: Unknown.

Type: Male, Canoe Creek, 12 miles south of St. Cloud on Vermont Avenue, Fla., April 4, 1940, S. M. Brown, Jr. (Townes).

Paratype: Male, Little Falls, D. C., August 22, 1915, W. L. McAtee (USNM).

135. *Tendipes (Tendipes) stigmaterus* (Say), new combination

- Chironomus stigmaterus* Say, 1823, Jour. Acad. Nat. Sci. Phila. 3:15 (Leconte Ed. 2:42); type locality: United States. (Specimen determined by Say, from Pennsylvania, is in the Vienna museum.)
- Chironomus glaucurus* Wiedemann, 1828, Ausseureuropäische zweiflügelige Insekten 1:15; description, new name for *Chironomus stigmaterus* Say.
- Chironomus stigmaterus* Johannsen, 1905, Bull. N. Y. State Mus. 86:241; description.
- Chironomus stigmaterus?* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:453; description.
- Chironomus stigmaterus* Kieffer, 1917, Ann. Mus. Nat. Hung. 15: 345; description (mis-determined?).
- Chironomus stigmaterus* Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:277; notes on specimen determined by Say.
- Chironomus cingulatus* Fellton, 1940, Jour. Econ. Ent. 33: 252-263; biology, mis-determination of *cingulatus* Meigen.

Male: Wing 4.1 mm. long; leg ratio 1.45; antennal ratio 4.8; body of medium build; frontal tubercles large; clypeus small; middle portion of pronotum very strongly and abruptly widened; fore tarsus with a long dense beard.

Light brown with a strong cinereous pruinosity. Flagellum and mouthparts brown; lighter portions of thorax tinged with green; wing veins stramineous; vein r-m dark brown; legs stramineous, the apices of the tibiae and basal tarsal segments brown; apical tarsal segments brown; abdomen brown, darker towards the apex and paler near the incisures.

Genitalia: Figure 135. Similar to those of *T. decorus* (figs. 136A, 136B, 136C, and 136D), but with the superior appendage more slender and straighter.

Female: Similar to the male except for the usual sexual differences.

The pale brownish-cinereous color, the strongly produced central portion of the pronotum, and the long heavy beard on the fore tarsus of the male make this species easy to recognize.

Material: Many males and females from Arizona (Douglas); Florida (Biscayne Bay, Charlotte Harbor, Ft. Lauderdale, Jacksonville, Lake Worth, and West Palm Beach); Nebraska (Oak Creek at Lincoln); New Jersey (Brigantine, Cape May, and Moorestown); New Mexico (Roswell and Torrence County); New York (Worlds Fair Grounds at Flushing); Ohio (Summit County) Texas (Galveston and San Antonio); and Mexico (Tlahualilo). Collecting dates of interest are May at Galveston, Tex.; June 10 at Moorestown, N. J.; September 9 at Brigantine, N. J.; October 16 at Lincoln, Nebr.; and December 4 at Tlahualilo, Mexico. Presumably, the adults occur throughout the growing season.

136. *Tendipes (Tendipes) decorus* (Johannsen), new combination

- Chironomus anonymus* Dyar, 1902, Proc. Ent. Soc. Wash. 5: 57; biology; description of larva and pupa; mis-determination of *anonymus* Williston.
- Chironomus similis* Johannsen, 1905, Bull. N. Y. State Mus. 86: 236; type locality: A female cotype from Chicago, Ill., is hereby designated lectotype (Johannsen collection). New synonymy.
- Chironomus decorus* Johannsen, 1905, Bull. N. Y. State Mus. 86:239; type localities: Illinois, Iowa, Kansas, Nebraska, New York, Ohio, and Washington (Johannsen collection); description of larva, pupa, and adult.

- Chironomus maturus* Johannsen, 1908, Bull. N. Y. State Mus. **124**:279; type locality: Ithaca, N. Y. (Johannsen collection). New synonymy.
- Chironomus cayugae* Tilbury, 1913, Jour. N. Y. Ent. Soc. **21**:305-308; biology; description of all stages.
- Chironomus cayugae* Johannsen, 1913, Jour. N. Y. Ent. Soc. **21**:308; type locality: near Cayuga Lake, Ithaca, N. Y. (Johannsen collection). New synonymy.
- Chironomus maturus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:469; description.
- Chironomus decorus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**: 472; description of larva, pupa, and adult.
- Chironomus cristatus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:481; description; misdetermination (?) of *cristatus* Fabricius.
- Chironomus decorus* Ping, 1917, Canad. Ent. **49**:418-426; biology; description of all stages.
- Chironomus cristatus* Kieffer, 1917, Ann. Mus. Nat. Hung. **15**:345; description; misdetermination (?) of *cristatus* Fabricius.
- Chironomus distinguendus* Kieffer, 1917, Ann. Mus. Nat. Hung. **15**: 346; type locality: Pullman, Wash. (Budapest museum). New synonymy.
- Chironomus maturus* Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. **14**: 40, 42; biology.
- Chironomus decorus* Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. **14**: 40, 42, 51, 56, 64, 65; biology.
- Chironomus cayugae* Leathers, 1922, Bull. U. S. Bur. Fisheries **38**:20-22; larval habits.
- Chironomus decorus* Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. **15**:349, 394, 401, 415; biology.
- Chironomus maturus* Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. **15**: 373; biology.
- Chironomus decorus* Richardson, 1928, Bull. Ill. Nat. Hist. Surv. **17**:406; biology.
- Chironomus decorus* Branch, 1928, Ann. Ent. Soc. Amer. **21**:567; description of eggs.
- Chironomus decorus* Branch, 1931, Trans. Kans. Acad. Sci. **34**:151; description of eggs and larva.
- Chironomus* (*Chironomus*) *decorus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**: 48; description of larva and pupa.
- Chironomus decorus* Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. **27**, suppl.: 171; biology.
- Chironomus decorus* Beyer, 1941, Iowa non-biting Midges (mimeographed) p. 3; biology.
- Chironomus* (*Chironomus*) *decorus* Miller, 1941, Univ. Toronto Studies (biol. ser.) **49**: 49, 61, 62; biology.
- Chironomus decorus* Lindeman, 1941, Amer. Midland Nat. **26**: 644, 663-665; biology.
- Chironomus decorus* Lindeman, 1942, Amer. Midland Nat. **27**: 428-433; biology.
- cayugae* Eggslater, 1931, Ecol. Monogr. **1**: 231-232.

Male: Wing 3.8 mm. long; leg ratio 1.5; antennal ratio 4.0; body slender; frontal tubercles large; clypeus of medium size; middle portion of pronotum somewhat widened; fore tarsus without a beard or sometimes with a short beard.

Ground color light pruinose green to stramineous or light brown. Antenna, mouthparts, and thoracic markings brownish ochraceous to dark brown; wing veins pale brown; vein r-m and the surrounding wing membrane dark brown; veins Cu₂ and 2A and a narrow margin of the surrounding wing membrane more or less brown (fig. 225); legs stramineous, greenish towards their bases and brownish towards their apices; apex of fore femur and basal 0.3 of fore tibia pale brown; apices of tibiae and tarsal segments brown; abdomen usually pale green with the tergites 2 to 7 each with a central transverse brown band occupying from 0.25 to most of its length; genitalia brown.

Genitalia: Figures 136A, 136B, 136C, and 136D. Figure 136A represents the typical genitalia. Figures 136B, 136C, and 136D show variations that commonly occur. Figure 136B represents a type common in Nevada material.

Female: Similar to the male except for the usual sexual differences.

The size, broad anal point, absence (usually) of tarsal beard, brown on veins Cu_2 and 2A, and the large frontal tubercles serve to distinguish this abundant and exceptionally variable species from others in the subgenus. Occasional specimens have the abdomen entirely green.

Very probably the name *decorus* will eventually fall as a synonym of one or more of Walker's names or of *Chironomus cristatus* Fabricius; but until the types are studied, these names can not be applied with certainty. Malloch (1915, Bull. Ill. State Lab. Nat. Hist. 10:481) designated a neotype for *Chironomus similis* Johannsen. There is an authentic cotype of *C. similis* in Johannsen's collection. Malloch's neotype does not belong to this subgenus.

Material: Very many males and females from Alberta (Edmonton, Fawcett, and Waterton Lakes); Arizona (Flagstaff and Williams); British Columbia (Oliver, Osoyoos, and Willington); California (Bericia, Bryte in Yolo County, Crescent City, Los Angeles, Palo Alto, Salton Lake, San Diego, Smith River, and Summit in Placer County); Colorado (Boulder, Ft. Collins, Grand Lake, Hayden, and Mt. Home Lake at Ft. Garland); Connecticut (Canaan); Delaware (Rehoboth); District of Columbia (Eastern Branch near Benning, Rock Creek, and Washington); Florida (Biscayne Bay, Jacksonville, Monticello, and West Palm Beach); Idaho (Cataldo, Market Lake, Moscow, Riverside, and Sandpoint); Illinois (Algonquin, Burlington, Chicago, Evanston, Lilly, Momence, Peoria, Rockford, Rock Island, and Urbana); Indiana (Cedar Lake, Indianapolis, La Fayette, and Mineral Springs); Iowa (Ames, Davenport, and Mt. Pleasant); Kansas (Atchinson County, Baldwin, Lawrence, and Manhattan); Kentucky (Middlesboro and Paris); Louisiana (Mound and Schriever); Maine (Lincoln County); Manitoba (Aweme and Churchill); Maryland (Bladensburg, Cabin John, Chesapeake Beach, Fenwick, Glymont, High Island, Jackson's, Lloyds, Plummers Island, and Riggs Mill); Massachusetts (Amherst, Holliston, Montgomery, Mt. Tom, Musquashiat Pond at Scituate, Oak Bluffs, South Hadley, Westfield, West Springfield, Woods Hole, and Worcester); Michigan (Alto, Ann Arbor, Bear Lake, Cheboygan County, Detroit, Douglas Lake, East Lansing, Empire, Grand Rapids, Isabella County, 19 miles north of Lapeer, Manistee County, Mason County, Milford, Midland County, Missaukee County, Nottawa, Osceola County, Portage Lake in Washtenaw County, Roscommon, and Sanilac County); Minnesota (Argyle, Browns Valley, Cass Lake, Coon Creek in Anoka County, Crookston, Crystal Lake, Fish Hatchery in Leseur County, Fort Snelling, Hallack, Houston County, Lake Lida, Luverne, Minneapolis, Nine Mile Creek in Hennepin County, Olmstead County, St. Anthony Park, St. Paul, Shakopee, Round Lake at New Brighton, and White Fish Lake); Mississippi (Agricultural and Mechanical College, Bay St. Louis, Lucedale, and Westpoint); Missouri (Atherton and St. Louis); Montana (Big Timber, Laurel, and Missoula); Nevada (Reno and Steamboat); New Hampshire (Berlin, Center Harbor, Franconia, and Mt. Washington); New Jersey (Anglesea, Atsion, Cap May, Chatham, Chesilhurst, Clementon, Delaware Water Gap, Lenola, Midland Park, Moorestown, Newark, New Brunswick, Riverton, and Westville); New Mexico (Mesilla Park and Torrence); New York (Ashokan Reservoir, Barrytown, Bellport, Bemus Point, Camelot, Canadarago Lake, Castle Point, Chatham Center, Cobleskill, Connecticut Hill, Cornwall, Croton Point, Croton Reservoir, Delta Lake near Rome, Eagle Bridge, Flushing, Freeville, Germantown, Glenida Lake, Greenwood Lake, Hancock, Hudson, Hyde Park, Ithaca, Kinderhook, Kingston, Mayville, McLean, Milford Center, Muscoot Reservoir, Newport, Niskayuna, North Fairhaven, North Petersburg, Old Forge, Olean, Otsego Lake, Owego, Peekskill, Plandrome, Poughkeepsie, Rhinecliff, Rome, Scarboro, South Trenton, Spencer, Staatsburg, Still-

water, Syracuse, Tuxedo, Valley Falls, and Whitesville); North Carolina (Nantahala Gorge and Raleigh); North Dakota (Fargo and Mandan); Ohio (Columbus, Franklin County, Sandusky, Summit County, and Toledo); Oklahoma (Chicasha, Elmer, Ft. Gibson, Gore, Grandfield, Hinten, Okemah, Oswalt, Pearson, Roff, Sherwood, and Sulphur); Ontario (Black Rapids in Rideau River, Centerville, Costello Lake in Algonquin Park, Fisher's Glen, Leamington, Niagara Falls, Niagara Glen, Normandale, Orillia, Ottawa, Point Pelee, Power Glen, Rondeau Park, Tillsonburg, Toronto, and Trenton); Oregon (Cannon Beach, Corvallis, Klamath Falls, Linn County, and Takenitch Lake); Pennsylvania (Natrona, Philadelphia, and Pottstown); Quebec (Aylmer, Beaulieu, Beloeil, Covey Hill, Hemmingford, Hull, Knowlton, Lachine, Laprairie, Montreal Island, Norway Bay, Ottawa Golf Club, Putnam, Quebec, and St. Davids); Rhode Island (Westerly); Saskatchewan (Attons Lake at Cut Knife and Waskesiu); South Carolina (Greenville); South Dakota (Brookings, Chamberlain, and Mitchell); Tennessee (Marshall, Memphis, and Norris Dam); Texas (Brownsville, College Station, Cotulla, Dallas, Devils River, Kerrville, Laredo, Liberty, and Paris); Utah (mouth of Bear River, Benson, Blue Creek, Hooper, River Heights, and Wanship); Virginia (Dead Run in Fairfax County, Dyke, Falls Church, Glencarlyn, Lloyds, Mountain Lake, Mt. Vernon, Richmond, and Rosslyn); Washington (Ashford, Lake Cushman, Orondo, Seattle, and South Prairie); and Wisconsin (Eagleton). Adults are on the wing from early spring to late fall and may be found in numbers at any time during the growing season, though their abundance fluctuates considerably during the season. The species breeds in a wide variety of lakes, ponds, rivers, and streams and is the most abundant and widespread of our larger tendipedids.

137. *Tendipes (Tendipes) tuxis* (Curran), new combination

Chironomus tuxis Curran, 1930, Bull. Amer. Mus. Nat. Hist. 61:31; type locality: Tuxedo, N. Y. (Amer. Mus.).
 ?*Chironomus (Chironomus) tuxis*? Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210: 47; description of pupa.

Male: Wing 3.4 mm. long; leg ratio 1.63; antennal ratio 3.8; body moderately slender; frontal tubercles small; clypeus small; middle portion of pronotum hardly at all widened; fore tarsus without a beard.

Blackish brown and pruinose. Anterior wing veins brown, vein r-m darker; posterior wing veins not pigmented; legs pale brown towards their bases, brown towards their apices; apical portion of femora, basal portion of tibiae, and apices of tibiae and tarsal segments somewhat darker.

Genitalia: Figure 137, drawn from the type. Similar to those of *T. decorus* (fig. 136A) but the superior appendage shorter and stouter.

Female: Unknown.

This species and *atrella* are the two smaller blackish species of this subgenus in the Nearctic Region. *Tuxis* differs from *atrella* in its smaller size, greater leg ratio, and in lacking the tarsal beard in the male. Abnormally dark specimens of *T. riparius* may be distinguished from the present species on male genitalia.

Material: Male, Lakehurst, N. J., August 5, 1939, H. K. Townes (Townes); male, Moorestown, N. Y., June 6, 1939, H. and M. Townes (Townes); male, Riverton, N. J., June 18, 1939, H. K. Townes (Townes); male, Hudson, N. Y., August 31, 1936, H. K. Townes (Townes); male, Prattsville, N. Y., August 8, 1934, H. K. Townes (Townes); male (type), Tuxedo, N. Y., August 28, 1928, C. H. Curran (Amer. Mus.); male, Westchester County, N. Y., June 19, 1936, H. K. Townes (Townes).

138. *Tendipes (Tendipes) atrella*, new species

Male: Wing 4.1 mm. long; leg ratio 1.35; antennal ratio 3.9; body slender; frontal tubercles small; clypeus of medium size; middle portion of pronotum somewhat widened; fore tarsus with a long sparse beard.

Blackish brown. Anterior wing veins brown, vein r-m somewhat darker; posterior wing veins pale brown; legs brown.

Genitalia: Figure 138. Similar to those of *T. decorus* (fig. 136A) but the anal point narrower and the superior appendage shorter and stouter.

Female: Unknown.

Larger specimens of this species are very similar to smaller specimens of *T. utahensis*, but may usually be distinguished in the male by the somewhat sparser tarsal beard, narrower anal point, paler legs, and greater pruinosity of the body. The species is also similar to *T. tuxis*. I have seen several series of specimens from localities within the range of *T. atrella* which differ only in the lack of a beard on the male fore tarsus. These may or may not represent a distinct species.

Type: Male, Reno, Nev., August 28, 1915, H. G. Dyar (USNM).

Paratypes: Two males, 1 female, Nordegg, Alberta, July 6 and 7, 1921, J. McDunnough (CNC); male, Tahoe City, California., June 18, 1920, H. G. Dyar (Townes); male, Denver, Colo., May 17, 1901, Dyar and Caudell (USNM); male, Ft. Collins, Colo., August 8, 1935, Ralph Swain (Colo.); male, Aweme, Manitoba, September 3, 1933, N. Criddle (CNC); male, Carroll, Manitoba, August 23, 1923, N. Criddle (CNC); 6 males, Oak Bluffs, Mass., July 22, 1939, C. N. Smith (USNM); male, Luverne, Minn., May 25, 1926, Sam Kepperly (Townes); 3 males, Luverne, Minn., June 24, 1925, C. E. Mickel (Minn.); male, Nine Mile Creek, Anoka County, Minn., May 23, 1934, D. Denning (Townes); 27 males, 1 female, Brackley Beach, Canadian National Park, Prince Edward Island, July 2, 1941, J. McDunnough and T. N. Freeman (CNC); 23 males, Reno, Nev., July 4 to Sept. 29, 1915, and 1916, H. G. Dyar (USNM, Townes); 2 males, Brookings, S. Dak. (USNM); 2 males, Erwin, S. Dak. (USNM); male, female, South Dakota (USNM).

139. *TENDIPES (TENDIPES) RIPARIUS* (Meigen)

Chironomus riparius Meigen, 1804, Klass. Besch. europ. zweifl. Ins., p. 13; type locality: ?near Paris (?Paris museum). This reference not seen.

Chironomus dorsalis of authors, not of Meigen.

Tendipes riparius Kieffer, 1911, Bull. Soc. d'Hist. Nat. Metz 27: 36, 41; description, generic placement.

Chironomus dorsalis Gahan, 1912, Proc. Ent. Soc. Wash. 14:102-105; biology, mis-determination of *dorsalis* Meigen.

Chironomus viridicollis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:457-463; biology, description of larva, pupa, and adult; misdetermination (?) of *viridicollis* Wulp.

Chironomus serus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:481; type locality: Urbana, Ill. (Ill.). New synonymy.

- Chironomus viridicollis* Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. 14:41, 42, 51; biology, misdetermination (?) of *viridicollis* Wulp.
Chironomus cristatus Branch, 1923, Jour. N. Y. Ent. Soc. 31:15-30; biology, description of all stages, misdetermination (?) of *cristatus* Fabricius.
Chironomus viridicollis Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15:421; biology, misdetermination (?) of *viridicollis* Wulp.
Chironomus (*Chironomus*) *militaris* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:46; type locality: Stream polluted with milk wastes, Adams Center, N. Y. (Johannsen collection). New synonymy.
Chironomus (*Chironomus*) *serus*? Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:48; description of pupa.

Male: Wing 3.7 mm. long; leg ratio 1.6; antennal ratio 3.3; body slender; frontal tubercles rather small; clypeus rather small; middle portion of pronotum distinctly widened; fore tarsus without a beard.

Ground color pale to dark brown, somewhat polished and slightly pruinose. Antenna, mouthparts, and thoracic markings red brown to blackish brown; anterior wing veins brown, vein r-m somewhat darker; posterior wing veins unpigmented; legs pale green to light brown towards their bases, brown towards their apices; apex of fore femur, basal 0.3 of fore tibia, and apices of all tibiae and tarsal segments darker; abdomen brown to blackish, the apical 0.25 of each tergite pruinose and pale. Specimens developed in very cold water are often black with dark-brown legs.

Genitalia: Figure 139. The broad short superior appendage and the narrow anal point are distinctive.

Female: Similar to the male except for the usual sexual differences.

This species is rather similar to *T. decorus* but the lack of pigmentation on veins Cu₂ and 2A, the smaller and more slender frontal tubercles, and the different genitalia distinguish it. In body coloration it is usually darker, especially on the abdomen, and more shiny than is *T. decorus*. Unusually dark specimens resemble *T. tuxis* and *T. atrella*.

Though European material has not been available for study, there seems to be no way of distinguishing Nearctic from Palaearctic material. I have a male specimen from Poterillos, Argentina, collected at 4,000 feet, March 16 to 20, 1920, by R. G. Harris, so the species evidently has a very wide range.

Material: Many males and females from Alaska (Anchorage); Alberta (Banff, Lethbridge, Morrin, Nordegg, Tilley, and Wabamun); Colorado (Estes Park, Florissant, and Grand Lake); District of Columbia (Washington); New Hampshire (Mt. Madison at 4,600 ft.); Indiana (Greencastle); Iowa (Davenport); Kansas (Douglas County at 900 feet); Manitoba (Aweme and Winnipeg); Maryland (College Park); Massachusetts (Agawan, Amherst, West Springfield, and Worcester); Michigan (Alto, Clare County, East Lansing, Eaton County, Midland County, Otsego County, and Roscommon County); Minnesota (Cass Lake, Itasca Park, St. Anthony Park, St. Paul, and Wyoming); Missouri (Atherton and Charleston); Nevada (Reno); Newfoundland (Funk Island); New Hampshire (Berlin); New Jersey (Orange, Rancocas Park, and Westville); Northwest Territories (Camp Kungovik on west coast of Baffin Island, 65°35' N.); New York (Buffalo, Connecticut Hill, Fonda, Garrettsville, Hamburg, Hudson, Ithaca, and McLean); North Carolina (Raleigh); Ohio (Summit County); Ontario (Guelph, Orillia, Ottawa, and Point Pelee); Pennsylvania (Fern Rock and Philadelphia); Quebec (Beaupré, Quebec, and Wakefield); Rhode Island; South

Carolina (Greenville); Virginia (Falls Church and Maywood); and "Hudson Bay Territory." Adults are on the wing throughout the growing season but are most common, or at least most often collected, in the early spring. Early and late collecting dates are April 16 at Ithaca, N. Y.; April 26 at Quebec, Quebec; October 12 at Davenport, Iowa; and October 30 at Raleigh, N. C. This species frequently breeds in very large numbers in heavily polluted water. Though much of our literature indicates that many species of "blood worms" breed most freely in polluted water, the present species and perhaps *Tendipes tentans* are the only ones that can truthfully be called indicators of pollution conditions. All others breed most abundantly in unpolluted water, though many of them are tolerant of certain degrees of pollution. This species is widespread and common in Europe.

140. *Tendipes (Tendipes) decumbens* (Malloch), new combination

Chironomus (Chironomus) decumbens Malloch, 1934, Mem. Carnegie Mus. 12, pt. 2, sect. 4: 16; type locality: Southampton Island, Keewatin, Northwest Territories (Carnegie Museum).

Male: Wing 4.7 mm. long; leg ratio 1.27; antennal ratio 4.5; body of medium stoutness; frontal tubercles of moderate size; clypeus rather small; middle portion of pronotum hardly at all widened; mesoscutum without a median tubercle; fore tarsus with a rather short depressed beard, the longer hairs of which arise at about 40° to 45° and are about 4.0 as long as the tibial diameter.

Blackish brown, the legs slightly paler than the body; anterior wing veins brown, vein r-m slightly darker; posterior wing veins tinged with light brown.

Genitalia: Figure 140, drawn from the type. Note the very narrow anal point and the shape of the superior appendage.

Female: Unknown.

Material: Male (type), Southampton Island, Keewatin, Northwest Territories, 1930, G. M. Sutton (Carnegie Museum). Redescribed and figured from the type. More material is needed to clarify the characters and status of this form.

141. *Tendipes (Tendipes) hyperboreus* (Staeger), new combination

Chironomus hyperboreus Staeger, 1845, Naturh. Tidsskr. (n.s.) 1: 349; type locality: West Greenland (Copenhagen museum).

Chironomus hyperboreus Lundbeck, 1898, Vidensk. Meddel. Nat. For. København 50:272; description.

Chironomus (Chironomus) hyperboreus Malloch, 1934, Mem. Carnegie Mus. 12, pt. 2, sect. 4: 15; description.

Chironomus (Chironomus) hyperboreus Andersen, 1937, Meddel. om Grønland 116, no. 1: 27-31; description of larva, pupa, and adult; redescription of cotypes.

Male: Wing 5.2 mm. long; leg ratio 1.25 (1.27 in cotype); antennal ratio 5.0; body moderately stout; frontal tubercles rather small; clypeus small; middle portion of pronotum slightly widened; mesoscutum without a median tubercle; fore tarsus with a long dense beard.

Blackish brown. Anterior wing veins brown, vein r-m somewhat darker; posterior wing veins not pigmented; legs brown (according to the original

description, blackish in the types), darker towards their apices and at the apices of the segments.

Genitalia: Figure 141. The shape of the superior appendage is rather unusual, but otherwise the genitalia are not very distinctive.

Female: Unknown to me.

Similar to *T. atrella*, *T. utahensis*, and *T. tuberculatus*; differing from each as follows: From *T. atrella* in larger size, lower leg ratio, and denser tarsal beard; from *T. utahensis* in higher leg ratio and narrower anal point; and from *T. tuberculatus* in lack of the mesoscutal tubercle and higher leg ratio.

This species is described and figured from a single male in the United States National Museum determined by Lundbeck. Although I can not be certain that it is correctly determined, it was very probably compared with the types by Lundbeck and, except that the types apparently have darker-colored legs, fits the descriptions of Staeger and Andersen as far as they go.

Material: Male, Egedesminde, Greenland, May 7, 1890 (USNM).

142. *Tendipes (Tendipes) biseta*, new species

Male: Wing 5.5 mm. long; leg ratio 1.4; antennal ratio 4.0; body of medium build; frontal tubercles small; clypeus of moderate size; middle portion of pronotum moderately widened; mesoscutum without a median tubercle; fore tarsus without a beard.

Dark brown. Anterior wing veins brown, vein r-m slightly darker; posterior wing veins pale brown; legs pale brown at their bases, dark brown towards their apices; apices of femora, bases of tibiae, and apices of tibiae and tarsal segments brown; abdomen with the apical part of each segment pruinose and slightly paler than the rest.

Genitalia: Figure 142, drawn from the type. The presence of several setae on the superior appendage is very unusual in this subgenus.

Female: Similar to the male except for the usual sexual differences.

In size, coloration, and lack of a tarsal beard in the male, this species resembles *T. atritibia*. It differs in genitalia and in having a small clypeus.

Type: Male, "Hudson Bay Territory" (Harvard).

Paratypes: Two females, same data as type (Harvard, Townes).

143. *Tendipes (Tendipes) utahensis* (Malloch), new combination

Chironomus utahensis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:438; type locality: Kaysville, Utah (USNM).

Chironomus utahensis Eggleton, 1931, Ecol. Monog. 1: 255; biology.

Chironomus utahensis Bonnell and Mote, 1941, Jour. Econ. Ent. 34:324; biology, description of eggs.

Chironomus utahensis Bonnell and Mote, 1942, Proc. Ent. Soc. B. C. 39:3-7; biology description of eggs and larva.

Male: Wing 4.6 mm. long; leg ratio 1.13; antennal ratio 4.5; body rather stout; frontal tubercles rather large; clypeus rather small; middle portion of pronotum moderately widened; mesoscutum with a weak central tubercle; fore tarsus with a long dense beard.

Blackish brown. Anterior wing veins brown, vein r-m slightly darker; posterior wing veins pale brown; legs entirely brown or pale greenish brown with the tarsi towards the apices and the apices of the segments brownish.

Genitalia: Figure 143. The short, broad, usually amber-colored anal point is distinctive.

Female: Similar to the male except for the usual sexual differences.

This is a moderately large blackish species with heavily bearded fore tarsus, rather small clypeus, and short, broad, pale anal point. Smaller specimens are difficult to distinguish from *T. atrella*. The Greenland *T. hyperboreus* is similar but has a longer and narrower anal point and greater leg ratio.

Material: Many males and females from Alberta (Elk Island and Lesser Slave Lake); Arizona (Williams); California (Alkali Lake in Antelope Valley); Colorado (Ft. Collins); Minnesota (Sand Lake); Nevada (Reno and Wells); Oregon (Klamath Falls, Klamath Lake, and Upper Klamath Falls); and Utah (Bear River Bay, Great Salt Lake, Honeyville, Magna, and Plain City). Adults have been collected from April 12 at Honeyville, Utah, to October 15 at Reno, Nev. According to Bonnell and Mote, this species breeds in such enormous numbers in the Klamath lakes of Oregon that adults are a nuisance to local residents. They have applied the common name "Klamath midge" to the species.

144. *Tendipes (Tendipes) tuberculatus*, new species

Male: Wing 4.6 mm. long; leg ratio 1.15; antennal ratio 6.0; body rather stout; frontal tubercles small; clypeus of medium size; middle portion of pronotum moderately widened; mesoscutum with a strong central more or less double tubercle; fore tarsus with a long dense beard.

Blackish brown. Anterior wing veins brown, vein r-m slightly darker; posterior wing veins pale; legs brown.

Genitalia: Figure 144, drawn from the type.

Female: Similar to the male except for the usual sexual differences.

The strong tubercle in the center of the mesoscutum is an easy recognition mark for this species. Except for this character, the species is superficially rather similar to *T. utahensis*.

Type: Male, "Hudson Bay Territory" (Harvard).

Paratypes: Nine males. 5 females, same data as the type (Harvard, Townes); 4 males, Lesser Slave Lake, Alberta, June 12, 1940, R. B. Miller (Miller, USNM).

145. *TENDIPES (TENDIPES) PILICORNIS* (Fabricius)

Tipula pilicornis Fabricius, 1794, Ent. Syst. 4: 243; type locality: "Habitat Kiliae" (cotype in British Museum).

Chironomus conformis Malloch, 1923, North Amer. Fauna **46**: 172; type locality: St. Paul Island, Alaska (USNM). New synonymy.

Tendipes pilicornis Kruseman, 1933, Tijdschr. Ent. **76**: 163; description, generic position.

Male: Wing 5.5 mm. long; leg ratio 0.98; antennal ratio 6.5; body very stout; frontal tubercles rather small; clypeus large; middle portion of pronotum moderately widened; fore tarsus with a long very dense beard; legs somewhat inflated.

Black. Body hairs brown; anterior wing veins light brown, vein r-m darker; posterior wing veins not pigmented; tip of halter knob usually brown; legs brown.

Genitalia: Figure 145. The rather narrow anal point is unusual among the larger blackish species of this subgenus.

This is a large robust species with coal black body and brown legs that are unusually pale in contrast. The wing veins also are unusually pale. It is unique in the genus in having a leg ratio of 0.95 to 1.0.

Nearctic material has been compared with a male and female from England, determined by Edwards.

Material: Three males, Waterton Lakes, Alberta, June 19 and 20, 1923, J. McDunnough (CNC); male, Point Barrow, Alaska, June 21, 1882, John Murdock (USNM); male, female, St. Paul Island, Bering Sea, Alaska, June 5, 1913, A. G. Whitney (USNM); male, female, St. Paul Island, Bering Sea, Alaska, August 16, 1914, E. A. Preble (USNM); 12 males, 6 females, Oxbow, Saskatchewan, May 28, 1907, Fredk. Knab (USNM, Townes); and male, Saskatoon, Saskatchewan, May 5, 1923, K. M. King (CNC). The species occurs also in northern Europe.

146. *Tendipes (Tendipes) staegeri* (Lundbeck), new combination

Chironomus hyperboreus var., Staeger, 1845, Naturh. Tidsskr. (n.s.) **1**:349; description.

Chironomus staegeri Lundbeck, 1898, Vidensk. Meddel. Nat. For. København **50**:271; type locality: a male from the type series, collected by Lundbeck at Egedesminde, Greenland, May 17, 1890, is hereby selected lectotype (USNM).

Chironomus fasciventris Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:438; type locality: Dubois, Ill. (Ill.). New synonymy.

?*Chironomus riparius* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**:443; description, misdetermination of *riparius* Meigen.

Chironomus fasciventris Eggleton, 1931, Ecol. Monog. **1**:255; biology.

Chironomus (Chironomus) staegeri Malloch, 1934, Mem. Carnegie Mus. **12**, pt. 2, sect. 4: 15; description.

Chironomus (Chironomus) fasciventris Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**:48; description of pupa.

Male: Wing 5.7 mm. long; leg ratio 1.35; antennal ratio 5.2; body moderately slender; frontal tubercles large; clypeus rather large; middle portion of pronotum moderately widened; fore tarsus with a short beard on its outer side, appressed and all in one plane.

Ground color light pruinose brown, often with a greenish tinge. Dark brown as follows: Pedicel, flagellum except base, clypeus, mouthparts, extensive thoracic markings, submedian transverse band on tergites 1 to 6 occupying about 0.3 to 0.7 the length of the tergites, and all of segment 7 and the follow-

ing segments. If the tergal dark bands are unusually wide, only the apical 0.25 of each tergite is pale. Legs pale brown, brown at the apices; apices of femora and bases of tibiae brown, more distinctly and broadly so on the anterior legs; apices of tibiae and apices of tarsal segments brown. Anterior wing veins brown, vein r-m darker; posterior wing veins pale brown.

Genitalia: Figure 146. The long curved superior appendage ending rather bluntly is characteristic.

Female: Similar to the male except for the usual sexual differences.

Specimens of this species appear like small dark slender specimens of *T. plumosus* or large dark robust specimens of *T. decorus*, but are not difficult to distinguish on superficial appearance. The short beard, all on the outer side of the tarsus, is distinctive. The coloration is remarkably constant for this group of species, except that some specimens are almost as dark as normally colored *T. utahensis*. The lectotype and a paratype female of *Chironomus staegeri* in the United States National Museum are very dark colored specimens and the lectotype has the superior genital appendage somewhat shorter than usual.

Material: Many males and a few females from British Columbia (Royal Oak and Victoria); District of Columbia (Washington); Idaho (Moscow); Illinois (Burlington); Iowa (Davenport and Mt. Pleasant); Kansas (Lawrence); Labrador (Hopedale); Louisiana (Mound); Manitoba (Aweme); Massachusetts (Amherst and Cambridge); Michigan (Detroit); Minnesota (St. Paul); Missouri (Atherton, Charleston, and St. Louis); New Hampshire (Berlin); New Jersey (Riverton); New York (McLean, Sea Cliff, and Syracuse); North Carolina (Raleigh); Northwest Territories (Cameron Bay on Great Slave Lake); Ontario (Ottawa, and Smoky Falls on the Mattagami River); Pennsylvania (Pottstown); South Dakota (Ardmore); and Washington (Port Townsend and Seattle). Adults are on the wing throughout the growing season, but are scarce after midsummer and commonest in early spring. Early and late collection dates of interest are: March 3 at Raleigh, N. C.; March 28 at Victoria, British Columbia; April 1 at Atherton, Mo.; April 5 at Mt. Pleasant, Iowa; May 3 at Berlin, N. H.; and September 15 at McLean, N. Y.

147. TENDIPES (TENDIPES) ANTHRACINUS (Zetterstedt)

Chironomus anthracinus Zetterstedt, 1860, *Diptera Scandinaviae* 14:6499; type locality: Shores of Ringsjön Lake, southern Sweden (?Lund museum).

Chironomus hyperboreus var. *meridionalis* Johannsen, 1908, *Bull. N. Y. State Mus.* 124: 277; type locality: Not stated (Johannsen collection). New synonymy.

Chironomus meridionalis Needham, 1908, in *Hankinson: A Biological Survey of* Walnut Lake, Mich., p. 255; biology.

Chironomus hyperborealis (!) var. *meridionalis* Johannsen, 1926, *Jour. N. Y. Ent. Soc.* 34: 276; synonymy.

Chironomus hyperboreus Rempel, 1936, *Jour. Biol. Bd. Canada* 2:209-221; biology; morphology; description of larva, pupa, and adult; misdetermination of *hyperboreus* Staeger.

Chironomus (Chironomus) hyperboreus Johannsen, 1938, *Mem. Cornell Univ. Agr. Exp. Sta.* 210:48; description of larva and pupa; misdetermination of *hyperboreus* Staeger.

Chironomus hyperboreus Rempel, 1940, *Jour. Exp. Zool.* 84:261-289; intersexuality caused by parasitism, morphology, biology; misdetermination of *hyperboreus* Staeger.

Male: Wing 5.6 mm. long; leg ratio 1.15; antennal ratio 6.0; body stout; frontal tubercles of medium size; clypeus very large, larger than the pedicel;

middle portion of pronotum moderately widened; mesoscutum with a weak median tubercle; fore tarsus with a long sparse beard.

Blackish, the body hairs brown. Anterior wing veins dark brown, vein r-m slightly darker; posterior wing veins pale brown; legs blackish brown.

Genitalia: Figure 147. The anal point and the appendages are unusually short and broad.

Female: Similar to the male except for the usual sexual differences.

The large size, blackish color, large clypeus, and long sparse tarsal beard distinguish this species.

I have compared Nearctic material with a pair from England, determined by Edwards.

Material: Many males and females from Alberta (Lesser Slave Lake); California (Golden Lake Camp in Plumas County); Massachusetts (Amherst, Boston, Cambridge, Saugus, and Wellesley); Michigan (Roscommon County); Minnesota (Minneapolis); Montana (Many Glacier in Glacier National Park); New York (Juanita Island in Lake George and Otsego Lake); Ontario (Go Home Bay); Saskatchewan (Waskesiu); Washington (Mt. Rainier at 5,000 ft.); Wisconsin (Sandy Lake); and specimens from "Patterdale," collected by Cockerell. The species occurs also in Iceland and northern Europe. This species seems to be common in the far North. In temperate climates, it breeds only in the coldest lakes. Adults are on the wing from very early spring to early summer in the southern part of its range to midsummer in the northern part. The earliest record of capture known to me is March 28 at Amherst, Mass.

148. *Tendipes (Tendipes) atritibia* (Malloch), new combination

Chironomus (Chironomus) atritibia Malloch, 1934, Mem. Carnegie Mus. 12, pt. 2, sect. 4: 16; type locality: Southampton Island, Keewatin, Northwest Territories (Carnegie Museum).

Chironomus staegeri? Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 35, 45; biology, misdetermination of *staegeri* Lundbeck.

Male: Wing 5.2 mm. long; leg ratio 1.28; antennal ratio 4.0; body of medium build; frontal tubercles rather large; clypeus very large and somewhat elongate, wider than the pedicel; middle portion of pronotum moderately widened; mesoscutum without a median tubercle; fore tarsus without a beard.

Blackish brown. Anterior wing veins brown, vein r-m somewhat darker; posterior veins light brown; legs brown.

Genitalia: Figure 148A, drawn from the type, and 148B, drawn from a specimen from Kensico Reservoir, N. Y. The style is unusually narrow and elongate. Usually the anal point is broader than in the type (fig. 148A), but somewhat narrower than in figure 148B.

Female: Similar to the male except for the usual sexual differences.

Compare this species with *T. biseta* and with *T. hyperboreus*.

Material: Male, Osoyoos, British Columbia, May 18, 1923, C. B. Garrett (CNC); 3 males, 1 female, Kensico Reservoir, Westchester County, N. Y., June 19 and 25, 1936, H. K. Townes (Townes); 2 males, 2 females, Costello Lake, Algonquin Park,

Ontario, June 15, 1937, July 2, 1937, July 7, 1937, and August 15, 1937, R. B. Miller (Miller, Townes); male, Lake Nipissing, Ontario, June 6, 1929, F. P. Ide (CNC); male, Mecanic, Quebec, June 17, 1923, C. H. Curran (CNC).

149. TENDIPES (TENDIPES) PLUMOSUS (Linnaeus)

- Tipula plumosa* Linnaeus, 1758, Syst. Nat., Ed. 10, p. 587; type locality: Europe (location of type unknown).
- Chironomus ferrugineo-vittatus* Zetterstedt, 1850, Diptera Scandinaviae 9:3492; type localities; Several localities in central and southern Sweden (Lund museum).
- Chironomus plumosus* Riley, 1887, Rpt. U. S. Comm. Agr. for 1886, p. 503, pl. 9, figure of pupa and adult.
- Chironomus plumosus* Johannsen, 1905, Bull. N. Y. State Mus. 86: 236; description of larva, pupa, and adult.
- Chironomus ferrugineovittatus* Johannsen, 1905, Bull. N. Y. State Mus. 86:238; description.
- Chironomus plumosus* Needham, 1908, in Hankinson: A Biological Survey of Walnut Lake, Mich., pp. 253-255; biology.
- Tendipes plumosus* Coquillett, 1910, Proc. U. S. Nat. Mus. 37:612; generic position.
- Chironomus plumosus* Burrill, 1913, Bull. Wis. Nat. Hist. Soc. 10:124-163; biology, bibliography.
- Chironomus ferrugineovittatus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:446; description of larva, pupa, and adult.
- Chironomus plumosus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:447; description of larva, pupa, and adult.
- Chironomus ferrugineovittatus* Peterson, 1916, Ill. Biol. Monog. 3, No. 2, figs. 12, 88, 89, 152, 206, 207, 270, 312, 371, 531, and 532; morphology of head and its appendages.
- Chironomus plumosus* Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:411; biology.
- Chironomus plumosus* Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. 14: 40, 42, 51, 64; biology.
- Chironomus ferrugineovittatus* Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. 14: 51, 56, 64, 65, 72; biology.
- Chironomus plumosus* Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15: 333, 334, 349, 362, 373, 401, 415; biology.
- Chironomus ferrugineovittatus* Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15: 421, 422; biology.
- Chironomus imperator* Walley, 1926, Canad. Ent. 58: 64; type locality: Point Pelee, Ontario (CNC). New synonymy.
- Chironomus plumosus* var. *ferrugineovittatus* Johannsen, 1926, Jour. N. Y. Ent. Soc. 34: 276; note on the type.
- Chironomus plumosus* Richardson, 1928, Bull. Ill. Nat. Hist. Surv. 17: 406, 411, 427, 430, 434, 435, 438, 439, 465; biology.
- Chironomus ferrugineovittatus* Richardson, 1928, Bull. Ill. Nat. Hist. Surv. 17: 409; biology.
- Chironomus plumosus* Johnson and Munger, 1930, Ecology 11:110-126; biology.
- Chironomus plumosus* Eggleton, 1931, Ecol. Monog. 1:254; biology.
- Chironomus plumosus* var. *ferrugineovittatus* Eggleton, 1931, Ecol. Monog. 1:255; biology.
- Chironomus tentans* Nevin, 1936, Ann. Rpt. N. Y. State Conservation Dept. 25, suppl.: 200; biology, misdetermination of *tentans* Fabricius.
- Chironomus plumosus* Townes, 1937, Ann. Rpt. N. Y. State Conservation Dept. 26, suppl.: 221, 222; biology.
- Chironomus (Chironomus) plumosus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:49; synonymy, description of larva and pupa.
- Chironomus plumosus* Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 165, 171; biology.

- Chironomus plumosus* Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 2; biology.
Chironomus plumosus Lindeman, 1941, Amer. Midland Nat. 26: 644, 663, 665; biology.
Chironomus plumosus Lindeman, 1942, Amer. Midland Nat. 27:428-433; biology.
Chironomus plumosus Lindeman, 1942, Ecology 23:1-12; biology.

Male: Wing 5.9 mm. long; leg ratio 1.2; antennal ratio 6.0; body rather stout; frontal tubercles moderately large; clypeus large; middle portion of pronotum moderately widened, distinctly narrower than in *T. tentans*; fore tarsus with a long rather dense beard.

Ground color stramineous or light brown, often tinged with green. The following darker markings vary from light brown to blackish brown and are most extensive when darkest: Pedicel, flagellum, clypeus, mouthparts, thoracic markings, transverse band on tergites 1 to 6, and all of the seventh and following tergites. The dark tergal markings are submedian, widest on the midline, and may occupy from the central 0.3 to all but the posterior 0.25 of each tergite. Anterior wing veins light brown, vein r-m dark brown; posterior wing veins pale; legs pale brown with the knees, apices of tibiae and tarsal segments, and apical tarsal segments brown. Some specimens from the region of British Columbia, Washington, and Oregon have the abdomen pruinose green, without dark markings.

Genitalia: Figure 149. The long slender style is distinctive.

Female: Similar to the male except for the usual sexual differences.

This is the largest of all tendipedids. Large specimens reach a wing length of 7.5 mm. and in the male, a body length of 13 mm. This species and *T. fasciventris*, *T. crassicaudatus*, and *T. tentans* are the larger paler species of the subgenus in the Nearctic Region. The style of the male genitalia of each will distinguish it from the others. Females of the four are often difficult to determine with certainty.

Material: Very many males and females from Alabama (Leroy); Alberta (Beaver Lake, Ft. Rae in the Great Slave Lake region, High River, Lesser Slave Lake, Lethbridge, and Wabamun); Arkansas (Galloway); British Columbia (Kelowna, Keremeos, Oliver, Osoyoos, Salmon Arm, Vaisseau, and Vernon); California (Los Angeles, Palmdale, and San Diego); Colorado (Denver); District of Columbia (Washington); Idaho (Market Lake); Illinois (Havana); Iowa (Davenport and Mt. Pleasant); Kansas (Greenwood County and State Lake at Leavenworth); Manitoba (Aweme, Churchill, Cormorant Lake, and Teulon); Massachusetts (Boston, Dorchester, Mt. Holyoke, Mt. Tom, and Provincetown); Michigan (Alcona County, Alto, Bay County, Beulah, Detroit, Douglas Lake, Empire, Grand Rapids, Iosco County, Kalamazoo, Mackinaw County, Manistee County, Menominee County, Midland County, Missaukee County, Nottawa, Roscommon County, Shelby, Silver Lake in Oceana County, and Walnut Lake); Minnesota (Anoka County, Big Stone County, Brainerd, Browns Valley, Buffalo, Cass Lake, Christmas Lake in Hennepin County, Cook County, Crookston, Ely, Fairmont, Fish Hatchery in Lesueur County, Ft. Snelling, Frontenac, Garrison, Glenwood Park, Goodhue County, Hastings, Houston County, Howard Lake, Lake City, Lake Johanna, Lake Lida, Luverne, Mille Lacs Lake, Minneapolis, Newport, Norman County, Olmstead County, Ortonville, Ottertail County, Ramsey County, Red Wing, Rush City, St. Anthony Park, St. Louis County, St. Paul, St. Peter, Vineland, and Winona County); Nevada (Reno); New Jersey (Clementon, Rancocas Park, and Riverton); New York (Ashokan Reservoir, Bemus

Point, Bridgeport, Buffalo, Canadarago Lake, Canajoharie, Cayuta Lake, Delta Lake near Rome, Freeville, Glenida Lake, Ithaca, Johnstown, Lakeside Park, Milford Center, Otsego Lake, Raquet Lake in Rensselaer County, and Tuxedo); North Carolina (Raleigh and Washington); Ohio (Husavick, Portage Lakes, Put-in Bay, and Sandusky); Ontario (Bell's Corners, Black Rapids in the Rideau River, Dryden, Georgian Bay, Go Home Bay, Honey Harbor, Kearney, Kingston, Leamington, Normandale, Orillia, Ottawa, Point Bruce, Point Pelee, Rondeau Park, Severn, Smoky Falls in the Mattagami River, Strathroy, and Trenton); Oregon (Klamath Falls, Portland, and Takenitch Lake); Pennsylvania (Fern Rock and Philadelphia); Prince Edward Island (Dalvay House in the Canadian National Park); Quebec (Foster, Knowlton, Knowlton's Lodge, and Lachine); Saskatchewan (Attons Lake at Cut Knife, Fish Lake, Saskatoon, Waskesiu, and Waskesiu Lake); South Dakota (Ardmore and Waubay); Texas (Paris); Utah (Benson, Hooper, and Promontory Point); Washington (Pullman and Seattle); and Wisconsin (Madison and Winnebago County). This species is also widespread and abundant in Europe and Asia. I have been able to examine a number of specimens from Europe. Adults occur throughout the growing season but are most abundant at particular seasons, usually in late spring or early summer, according to the particular breeding ground. Early and late collection dates of interest are March 24 at Promontory Point, Utah; April 3 at Washington, D. C.; April 8 at Seattle, Wash.; April 17 at Mt. Pleasant, Iowa; April 22 at Oliver, British Columbia; September 9 at Waskesiu, Saskatchewan; October 10 at Ithaca, N. Y.; and October 10 at Penticton, British Columbia. The normal breeding place is the soft mucky bottoms of eutrophic lakes or similar bottoms in the deeper areas of larger rivers, nearly always at depths greater than 4 meters and usually at depths of 6 to 20 meters. In such habitats the larvae are nearly always present in abundance.

150. *Tendipes (Tendipes) crassicaudatus* (Malloch),
new combination

Chironomus crassicaudatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:453; type locality: Peoria, Ill. (Ill.).

Chironomus crassicaudatus Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. 14: 40, 42; biology.

Chironomus (Camptochironomus) crassicaudatus Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 2; generic position.

Male: Wing 5.2 mm. long; leg ratio 1.23; antennal ratio 4.5; body very stout; frontal tubercles moderately large; clypeus of medium size; middle portion of pronotum moderately widened; fore tarsus with a rather short, sparse beard.

Ground color light or pale brown. Flagellum and mouthparts brown; pedicel, clypeus, and thoracic marking ochraceous brown; wing veins light brown, vein r-m dark brown; legs pale brown, the bases of the tibiae slightly darker; apices of tibiae and of tarsal segments brown; apical tarsal segments brown; abdominal tergites each with a central brown transverse band with indefinite edges; sixth and following segments mostly brown.

Genitalia: Figure 150. Intermediate between those of *T. tentans* (fig. 151) and typical *Tendipes*.

Female: Similar to the male except for the usual sexual differences.

This is a large, very stout, pale-brown species with indefinite darker abdominal markings. The male is easily distinguished by its genitalia. The female is difficult to distinguish from that of *T. tentans* or that of *T. plumosus*.

Material: Many males and females from Illinois (Homer Park); Iowa (Davenport and Kossuth County); Kansas (Lawrence and State Park at Leavenworth); Maryland (Fenwick); Michigan (Midland County); Minnesota (Hennepin County and Traverse County); Nebraska; New Jersey (Wildwood); Oklahoma (Oklahoma City); Ontario (Trenton, Ottawa, and Point Pelee); Pennsylvania (Philadelphia); and Texas (Brownsville and Lake Refugio at Twin Mott). Adults occur throughout the growing season. They have been collected from April 30 at Davenport, Iowa, to September 13 at Trenton, Ontario.

151. TENDIPES (TENDIPES) TENTANS (Fabricius)

- Chironomus tentans* Fabricius, 1805, Syst. Antliatorum, p. 38; type locality: Copenhagen, Denmark (Copenhagen museum).
Chironomus tentans Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**: 443; description of larva and adult.
Chironomus tentans var. *pallidivittatus* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. **10**: 445; type locality: Havana, Ill. (Ill.). New synonymy.
Chironomus tentans Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters **19**: 409-411; biology.
Chironomus tentans Richardson, 1921, Bull. Ill. State Lab. Nat. Hist. **14**: 41, 42, 51, 56, 65; biology.
Chironomus tentans Juday, 1922, Trans. Wis. Acad. Sci. Arts Letters **20**: 469-471; biology.
Chironomus tentans Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. **15**: 350, 381, 418, 421, 422; biology.
Tendipes (*Camplochironomus*) *tentans* Kruseman, 1933, Tijdschr. Ent. **76**: 174; description, generic placement.
Chironomus tentans Sadler, 1935, Mem. Cornell Univ. Agr. Exp. Sta. **173**: 1-25; biology, description of all stages.
Chironomus (*Camplochironomus*) *tentans* Johannsen, 1938, Mem. Cornell, Univ. Agr. Exp. Sta. **210**: 49; description of larva and pupa.
Chironomus (*Camplochironomus*) *tentans* Beyer, 1941, Iowa non-biting midges (mimeographed), p. 2; biology.

Male: Wing 5.8 mm. long; leg ratio 1.23; antennal ratio 3.8; body very stout; frontal tubercles of moderate size, conical; clypeus rather small; middle portion of pronotum rather strongly widened and produced; fore tarsus without a beard, its clothing hairs exceptionally short.

Ground color pale greenish to light brown. Pedicel, flagellum, palpus, and thoracic markings brown to blackish brown, usually contrasting strongly with the ground color. Anterior wing veins brown, vein r-m darker; posterior wing veins pale; legs pale brown at their bases, their apices brown; knees and apices of tibiae and tarsal segments brown; abdomen blackish brown, paler at the incisures.

Genitalia: Figure 151. Very large and heavy. Can be confused only with those of *T. crassicaudatus* (fig. 150).

Female: Similar to the male except for the usual sexual differences.

This is a large stout species with conspicuous mesoscutal stripes and dark abdomen. The male has very distinctive genitalia. Usually, the coloration and rather strongly produced middle portion of the pronotum enable one to determine female specimens.

Material: Many males and females from Alberta (Lethbridge and Millarville); British Columbia (Lilloet); Colorado (Ft. Collins); Illinois (Havana); Iowa (Ames,

Davenport, and Dickinson County); Manitoba (Aweme, Baldur, Churchill, Delta, St. Cloud, Strathclair, Teulon, Victoria Beach, and Winnipeg); Massachusetts (Provincetown); Michigan (Alto, Bay County, Detroit, East Lansing, Midland County, Nottawa, Ocenana County, and Tuscola County); Minnesota (Becker County, Carlos Avery Game Reserve, Chisago County, Crookston, Ft. Snelling, Fridley Sand Dunes in Anoka County, Gentilly, Lakeland County, Lesueur County, Minneapolis, Olmsted County, Plummer, Rush Lake at New Brighton, St. Paul, and Washington County); Montana (Big Timber); New York (Ithaca, Otsego Lake, and Rochester Junction); North Dakota (Tower City); Ontario (Ottawa and Point Pelee); Quebec (La Prairie); Saskatchewan (Attons Lake at Cut Knife, Oxbow, and Saskatoon); South Dakota (Big Stone City, Erwin, and Waubay); and Utah (Cache County). This species is widespread also in Europe, from which continent I have seen a number of specimens. Adults occur throughout the growing season. Early and late collection dates are April 29 at Havana, Ill.; May 6 at Ottawa, Ontario; and September 21 at Aweme, Manitoba. The species breeds in shallow water with much decaying organic matter: dead leaves, dead algae, or a moderate amount of organic pollution.

Genus GLYPTOTENDIPES

Palpus with 4 segments; male flagellum with 11 segments; antennal ratio 1.9 to 5.5; pronotum medially completely interrupted by a broad or very broad notch (figs. 233, 234, 240, and 241); squamal fringe present; wing membrane without macrotrichia; fork of Cu under or slightly beyond r-m; ends of R_1 and R_{2+3} slightly but distinctly separated; ends of R_{4+5} and M equidistant from the wing apex or, in the subgenus *Phytotendipes*, the end of R_{4+5} sometimes slightly closer than that of M; leg ratio 1.1 to 1.7; tarsal beard present or absent; fore tibia with an inner apical low rounded scale which projects only slightly beyond a somewhat similar scale on the opposite side of the tibia; combs of middle and hind tibiae broadly triangular, usually similar in shape, adjacent, but usually with a distinct notch between them, each with a short spine except in *G. (G.) unacus*, which has a single spine on each pair of combs; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present, simple; superior appendage horn-shaped, without setae beyond the base; inferior appendage oval or spatulate, with numerous setae. See figures 152 to 164.

KEY TO THE SUBGENERA OF GLYPTOTENDIPES

1. Abdominal tergites 3 to 6 without a median basal scar-like impression; frontal tubercles present *Demeijerea*, p. 136
- Abdominal tergites 3 to 6 each with a median basal scar-like impression (scars weak in subgenus *Glyptotendipes*) 2
2. Second abdominal tergite with a median basal scar-like impression; frontal tubercles present; female with first two flagellar segments not fused; body brownish *Phytotendipes*, p. 139
- Second abdominal tergite without a median basal scar-like impression; frontal tubercles absent; female with first two flagellar segments fused; body brownish or pale green *Glyptotendipes*, p. 144

Subgenus DEMEIJEREA

Demeijerea Kruseman, 1933, Tijdschr. Ent. 76:154. Genotype: *Tipula rufipes* Linnaeus (original designation and monobasic).

Female flagellum with 5 or 6 segments; frontal tubercles present; abdominal tergites without median basal impressions.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS DEMEIJEREA

1. Thorax jet black; median hair row of mesoscutum present 2
 Thorax pale greenish marked with pale orange brown; median hair row of mesoscutum absent 3
2. Front basitarsus blackish brown on the apical 0.3, the basal 0.7 dusky whitish or ochraceous 152. *brachialis* (Coquillett)
 Front basitarsus entirely blackish brown 153. *atrimanus* (Coquillett)
3. Antennal ratio about 4.8; female flagellum with the first and second segments separated by a movable joint; frontal tubercles rather large, cone-shaped, and about 2.0 as long as their basal diameter; corners at each side of median notch of pronotum angular; wing about 4.5 mm. long 154. *abruptus*, new species
 Antennal ratio about 3.8; female flagellum with the first and second segments fused; frontal tubercles small and globular; corners at each side of median notch of pronotum rounded off; wing about 3.6 mm. long 155. *obreptus*, new species

152. *Glyptotendipes* (Demeijerea) *brachialis* (Coquillett),
 new combination

Chironomus brachialis Coquillett, 1901, Proc. U. S. Nat. Mus. 23:607; type locality: Westville, N. J. (USNM).

Chironomus brachialis Johannsen, 1905, Bull. N. Y. State Mus. 86:200; description.

Chironomus brachialis Felton, 1940, Jour. Econ. Ent. 33:252-263; biology.

Chironomus (*Glyptotendipes*) *brachialis* Beyer, 1941, Iowa non-biting Midges (mimeographed), p. 4; generic placement.

Male: Wing 3.6 mm. long; leg ratio 1.18; antennal ratio 3.9; frontal tubercles minute, subglobular; pronotum gradually narrowed toward the center; median hair row of mesoscutum present; fore tarsus with a dense beard, long on the outer side and shorter on the inner side.

Head and its appendages brown; thorax shining blackish brown; abdomen yellow or light green, marked with blackish brown as follows: Basal transverse band on tergites 2 to 5, all beyond segment 5, and more or less of tergites 2 and 5; basal third of wing yellow, beyond which is an indefinite brown cloud occupying the central third of the wing (fig. 226); wing veins brown beyond their basal third; wing membrane mostly iridescent; halter knob pale yellow; legs ochre except at follows: Bases of coxae brownish; apices of femora, tibiae, and tarsal segments brown; front tibia and tarsus (except 0.7 of basitarsus, which is dusky whitish or ochre) and last two segments of middle and hind tarsi dark brown.

Genitalia: Figure 152. Similar to those of *G. atrimanus*.

Female: First and second flagellar segments fused, with a broad constriction and suggestion of a joint between them; basal segment of abdomen ochre, the rest blackish brown. Otherwise similar to the male except for the usual sexual differences.

Material: Many males and females from Montana (Big Timber); North Carolina (Lake Toxaway); New Jersey (Stark River and Westville); New York (Canajoharie, Ithaca, Niskayuna, Old Forge, and Worlds Fair Grounds at Flushing); Oregon ("on

the way to Lake of the Woods"); Pennsylvania (North Mountain); and Utah (Mendan). Adults have been collected from June 8 at North Mountain, Pa., to August 23 at Niskayuna, N. Y.

153. *Glyptotendipes (Demeijerea) atrimanus* (Coquillett),
new combination

Chironomus atrimanus Coquillett, 1902, Proc. U. S. Nat. Mus. 25:94; type locality: Kansas City, Mo. (USNM).

Chironomus brachialis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:426; description, misdetermination of *brachialis* Coquillett.

Male: Wing 3.6 mm. long; leg ratio 1.18; antennal ratio 3.4. Otherwise entirely similar to *G. brachialis* except that the basal 0.7 of the fore basitarsus is blackish brown (concolorous with the rest of the fore tarsus) instead of dusky whitish or ochre. There also seems to be a tendency for the dark wing and abdominal markings to be more extensive and for the abdominal pale markings to be less greenish than in *G. brachialis*.

Genitalia: Similar to those of *G. brachialis* (fig. 152).

Female: Similar to the female of *G. brachialis* except that the fore basitarsus is entirely blackish brown.

It is not at all certain that this and *G. brachialis* are distinct species. There is apparently an average difference in the antennal ratio, but not enough specimens have been measured to make certain that the difference is significant.

Material: Three females, Wabamun, Alberta, July 2, 1939, July 9, 1936, and July 12, 1931, E. H. Strickland (Alta.); female, Lyme, Conn., May 24, 1918, W. S. Fisher (USNM); 2 males, 1 female, Holliston, Mass., June 16, August 10, and August 12 (Harvard, Townes); male, near Plummers Island, Md., May 5, 1915, R. C. Shannon (Townes); male, Ithaca, N. Y. (Cornell); male, Mohawk River at Niskayuna, N. Y., August 23, 1934, H. K. Townes (Townes).

154. *Glyptotendipes (Demeijerea) abruptus*, new species

Male: Wing 4.5 mm. long; leg ratio 1.4; antennal ratio 4.8; frontal tubercles rather long, conical, and twice as long as their basal diameters; pronotum of rather uniform width except at the middle, where it is sharply notched, the corners at each side of the notch being angular; median hair row of mesoscutum wanting; fore tarsus with a long beard on the outer side.

Pale green. Flagellum beyond the first segment and mouthparts brown; thorax mostly pale orange brown, shining; anterior wing veins pale brown; halter knob greenish white; tarsi brownish towards their apices.

Genitalia: Figure 154. The superior appendage is somewhat larger and broader than in *G. obreptus* (fig. 155), and there are minor differences in the style and ninth tergite. Otherwise, the genitalia of this species and of *G. obreptus* are similar.

Female: Similar to the male except for the usual sexual differences. First and second flagellar segments with a strong constriction and an apparently movable joint between them.

Type: Male, Canajoharie, N. Y., July 15, 1934, H. K. Townes (Townes).

Paratypes: Two males, Columbia, Mo., May 6, 1906, to June 8, 1906, C. R. Crosby (Cornell); 4 females (Canajoharie, N. Y., July 1, 1934, July 7, 1934, July 15, 1934, and July 26, 1934, H. K. Townes (Rempel, Townes).

155. *Glyptotendipes* (Demeijerea) *obreptus*, new species

Male: Wing 3.6 mm. long; leg ratio (of female) 1.34; antennal ratio 3.8; frontal tubercles small and globular; pronotum of rather uniform width except at the median notch, the corners at each side of the notch rounded; median hair row of mesoscutum wanting; (fore tarsi of male specimens lacking).

Pale green. Flagellum beyond the first segment and mouthparts brown; thorax mostly pale orange brown, shining; tarsi brownish towards their apices.

Genitalia: Figure 155, drawn from the type. Similar to those of *G. abruptus* (fig. 154) except as noted under that species.

Female: Specimens that probably represent the female of this species are similar to the male except for the usual sexual differences. First and second flagellar segments separated by a weak constriction and an apparently immovable joint.

Type: Male, upper end of lake in Table Rock State Park, Pickens County, S. C., September 1, 1939, H. K. Townes (Townes).

Paratypes: Male, East Aurora, N. Y., July 17, 1910, M. C. Van Duzee (Calif. Acad.); female, Hamburg, N. Y., June 1, 1912, M. C. Van Duzee (Calif. Acad.); 3 females, Ithaca, N. Y., May 29, 1939, J. N. Belkin (Townes); female, Ithaca, N. Y., June 5, 1937, J. G. Rempel (Rempel); 2 females, Ithaca, N. Y., June 20, 1937, J. G. Rempel (Rempel); female, Ithaca, N. Y., July 11, 1937, J. G. Rempel (Rempel); male, Sport Island, Sacandaga River, N. Y., C. P. Alexander (Cornell).

Subgenus PHYTOTENDIPES

Phylotendipes Goetghebuer, 1937, in Lindner: Die Fliegen der Palaearktischen Region 13c:14. Genotype: *Chironomus pallens* Meigen (original designation).

Female flagellum with 6 segments; frontal tubercles present; abdominal tergites 2 to 6 each with a median basal scar-like impression.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS PHYTOTENDIPES

1. Fore legs dark reddish brown and much darker than the ochraceous to light reddish brown middle and hind legs; frontal tubercle about 3.5 as long as its basal diameter; fore tarsus of male without a beard.....156. *testaceus*, new species
- Fore legs stramineous to dark brown, approximately concolorous with the middle and hind legs; frontal tubercle about 1.5 as long as its basal diameter; fore tarsus of male usually with a long beard..... 2
2. Second segment of fore tarsus about 0.9 (male) or 1.0 (female) as long as the third; fore tarsus of male with a long dense beard.....157. *barbipes* (Staeger)

- Second segment of fore tarsus 1.0 to 1.35 (male) or 1.1 to 1.35 (female) as long as the third; fore tarsus of male with a long but less dense beard..... 3
3. Second segment of fore tarsus about 1.05 (male) or 1.1 (female) as long as the third; scar-like mark on base of sixth tergite about 0.4 as long as the tergite..... 158. *paripes* (Edwards)
- Second segment of fore tarsus about 1.3 as long as the third; scar-like mark on base of sixth tergite about 0.6 as long as the tergite..... 159. *lobiferus* (Say)

156. *Glyptotendipes* (*Phytotendipes*) *testaceus*, new species

Male: Wing 4.1 mm. long; leg ratio 1.47; antennal ratio 4.4; second segment of fore tarsus about 1.4 as long as the third; frontal tubercle about 3.5 as long as its basal diameter, very slender; central emargination of pronotum broader than in other Nearctic species of *Phytotendipes*; fore tarsus without a beard; scar-like mark at base of sixth tergite about 0.7 as long as the tergite and 4.0 as long as the scar at the base of the second tergite.

Testaceous to blackish testaceous, strongly pruinose. Wing veins brown; wing membrane tinged with brown and somewhat seamed with pale gray along the veins; halter knob brownish; front leg beyond coxa dark reddish brown; middle and hind legs beyond coxae ochraceous to pale reddish brown.

Genitalia: Similar to those of *G. lobiferus* (fig. 159).

Female: Second segment of fore tarsus about 1.45 as long as the third. Otherwise similar to the male except for the usual sexual differences.

Type: Male, Campfire Club Lake, Millwood, N. Y., June 28, 1936, H. K. Townes (Townes).

Paratypes: Thirty-nine males, 12 females from Arkansas (Galloway); Florida (Ford Mead and Plant City); Louisiana (Marksville and Mound); Maryland (Marlboro); Mississippi (Biloxi); New Jersey (Clementon, Leakesville, and Riverton); New York (Millwood); North Carolina (Raleigh and Wilmington); Oklahoma (Wister); and Pennsylvania (North Mountain and Philadelphia). These paratypes are in the collections of the United States National Museum, North Carolina, Harvard, Townes, Kansas, and Cornell. The dates of capture range from March 22 at Biloxi, Miss., and April 24 at Raleigh, N. C., to September 9 at Riverton, N. J., and September 11 at Marksville, La.

157. *GLYPTOTENDIPES* (*PHYTOTENDIPES*) *BARBIPES* (Staeger)

Chironomus barbipes Staeger, 1839, Naturh. Tidsskr. 2:561; type locality: ?Denmark (?Copenhagen museum). This reference not seen.

Chironomus barbipes Johannsen, 1905, Bull. N. Y. State Mus. 86:212; description.

Chironomus (*Glyptotendipes*) *barbipes* Edwards, 1929, Trans. Ent. Soc. London 77:392; description, generic position.

Glyptotendipes (*Phytotendipes*) *barbipes* Goetghebuer, 1937, in Lintner: Die Fliegen der palaearktischen Region 13c:15; description, generic position.

Male: Wing 5.0 mm. long; leg ratio 1.23; antennal ratio 5.0; second segment of fore tarsus about 0.89 as long as the third; body unusually stout; frontal tubercle minute, conical, about 1.5 as long as its basal diameter; central

emargination of pronotum narrower than in other Nearctic species of *Phytotendipes*; fore tarsus with a long very dense beard; scar-like mark at base of the sixth tergite about 0.6 as long as the tergite and 5.0 as long as the mark at the base of the second tergite.

Blackish brown and very strongly pruinose. Wing veins light or dark brown; halter knob stramineous; legs except coxae stramineous to fuscous.

Genitalia: Figure 157. Inferior appendage shorter and stouter than in other Nearctic members of the subgenus.

Female: Second segment of fore tarsus about 1.0 as long as the third. Otherwise similar to the male except for the usual sexual differences.

I have not seen European specimens, but according to the descriptions, they are not distinguishable from American specimens.

Material: Many males and females from Alberta (Edmonton, Lethbridge, and Tilley); British Columbia (Oliver); Colorado (Fort Collins); Iowa (Gritchie Manito Park); Manitoba (Aweme and Churchill); Michigan (Detroit, East Lansing, and Saginaw County); Minnesota (Carlos Avery Game Reserve, Chisago County, Lesueur County, Ramsey County, Rush Lake at New Brighton, and Wilmar); New Jersey (Pemberton); New York (Orient and Worlds Fair Grounds at Flushing); Pennsylvania (Delaware County and Philadelphia); Saskatchewan (Atton's Lake at Cut Knife); South Dakota (Erwin and Tower City); and Washington (Seattle). Adults are on the wing throughout the growing season, but judging from the collection dates, are most common in the spring. They have been collected from April 26 at Oliver, British Columbia, to September 10 at Telford, Minn. This species is widespread in central and northern Europe.

158. GLYPTOTENDIPES (PHYTOTENDIPES) PARIPES (Edwards)

Chironomus (Glyptotendipes) paripes Edwards, 1929, Trans. Ent. Soc. London 77:392; type locality: several localities in England (British Museum).

Glyptotendipes (Phytotendipes) paripes Goetghebuer, 1937, in Lintner: Die Fliegen der palaearktischen Region 13c:15; description, generic position.

Chironomus (Glyptotendipes) sp. 1, Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 165, 172; larval ecology.

Male: Wing 4.5 mm. long; leg ratio 1.33; antennal ratio 4.2; second segment of fore tarsus about 1.05 as long as the third; frontal tubercle minute, conical, about 1.5 as long as its basal diameter; central emargination of pronotum slightly narrower than in *G. lobiferus*; fore tarsus with a long, sparse to moderately dense beard; scar-like mark at the base of the sixth tergite about 0.4 as long as the tergite and 2.0 as long as the mark at the base of the second tergite.

Dark fuscous brown and strongly pruinose. Wing veins dark; wing membrane heavily seamed with pale gray along the veins; halter knob stramineous to fuscous; legs except coxae light yellowish brown marked with darker, or often mostly dark fuscous brown.

Genitalia: Similar to those of *G. lobiferus* (fig. 159).

Female: Second segment of fore tarsus about 1.1 as long as the third. Otherwise similar to the male except for the usual sexual differences.

I have not had the opportunity to examine specimens from Europe, but can find nothing in the descriptions which would lead one to believe that they are specifically distinct from American specimens.

Material: Many males and females from Alberta (Cypress Hills, Lethbridge, and Wabamun); Florida (Orlando, Ritta, and Tick Island); Manitoba (Churchill); Michigan (Mecosta County, Midland County, Missaukee County, Newaygo County, Nottawa County, Rodney, and Roscommon County); Minnesota (Cass Lake, Frontenac, Hennepin County, Olmsted County, St. Paul, St. Peter, Vineland, and Washington County); New Jersey (Culver's Lake, Pemberton, Shark River, and Westville); New York (Bemus Point, Canadarago Lake, Canajoharie, Mattituck, Orient, Otsego Lake, Westchester County, and Worlds Fair Grounds at Flushing); North Carolina (Lake Landing); Ontario (Ottawa, Smoky Falls of the Mattagami River, Sudbury, and Trenton); Oregon (Suttle Lake); Quebec (Knowlton); Rhode Island (Ashaway); and Saskatchewan (Atton's Lake at Cut Knife). Adults are on the wing throughout the growing season, but are most abundant during the summer. Early and late collecting dates of interest are January 5 at Orlando, Fla.; April 2 at Orient, N. Y.; May 8 at Nottawa, Mich.; and September 2 at Ottawa, Ontario. This species is common and widespread also in Europe.

159. *Glyptotendipes* (*Phytotendipes*) *lobiferus* (Say),
new combination

Chironomus lobiferus Say, 1823, Jour. Acad. Nat. Sci. Philadelphia 3:12 (Leconte Ed. 2: 41); type locality: "United States" (probably Philadelphia, Pa.). (A fragment of a specimen identified by Say is in the Vienna Museum.)

Chironomus lobifer Wiedemann, 1828, Aussereuropäische zweiflüglige Insecten 1:16; description, new name for *Chironomus lobiferus* Say.

Chironomus caliginosus Johannsen, 1905, Bull. N. Y. State Mus. 86:205; type locality: Ithaca, N. Y. (Johannsen). Name preoccupied by Meunier, 1904. New synonymy. *Chironomus lobiferus* Johannsen, 1905, Bull. N. Y. State Mus. 86:233; description of larva, pupa, and adult.

Chironomus ithacanensis Johannsen, 1908, Bull. N. Y. State Mus. 124:279; new name for *Chironomus caliginosus* Johannsen.

Chironomus gripekoveni Kieffer, 1913, Bull. Soc. d'Hist. Nat. Metz 28:22; type locality: Westphalia (location of type unknown). New synonymy.

Chironomus lobiferus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:430; description of larva, pupa, and adult.

Chironomus lobiferus Leathers, 1916, Science 43:183; biology.

?*Glyptotendipes americanus* Kieffer, 1917, Ann. Mus. Nat. Hung. 15:355; type locality: Rock Lake, Wash. (Budapest museum). New synonymy.

Chironomus lobiferus Muttkowski, 1918, Trans. Wis. Acad. Sci. Arts Letters 19:410; biology.

Chironomus lobiferus Richardson 1921, Bull. Ill. State Lab. Nat. Hist. 14: 41, 42, 51, 56, 65, 72; biology.

Chironomus lobiferus Leathers, 1922, Bull. U. S. Bur. Fisheries 38:7-19; description of larva and its biology.

Chironomus lobiferus Richardson, 1925, Bull. Ill. State Lab. Nat. Hist. 15:415; biology.

Chironomus lobiferus Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:276; note on specimen determined by Say.

Chironomus (*Glyptotendipes*) *lobiferus* Johannsen, 1928, Mem. Cornell Univ. Agr. Exp. Sta. 101:713; generic placement.

Chironomus lobiferus Richardson, 1928, Bull. Ill. Nat. Hist. Surv. 17:406, 411, 427; biology.

Chironomus lobiferus Branch, 1931, Trans. Kans. Acad. Sci. 34:154; description of eggs and larva.

Chironomus (*Glyptotendipes*) *lobiferus* Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:37; description of larva and pupa.

- ✓ *Chironomus lobiferus* Fellton, 1940, Jour. Econ. Ent. 33:252-263; biology. (*G. lobiferus*, *G. barbipes*, and *G. paripes* are confused in this paper as a single species.)
✓ *Chironomus lobiferus* Lindeman, 1941, Amer. Midland Nat. 26: 644, 663, 664, 665; biology.
Chironomus (*Glyptotendipes*) *lobiferus* Lindeman, 1942, Amer. Midland Nat. 27: 433-435; biology.

Male: Wing 4.6 mm. long; leg ratio 1.44; antennal ratio 4.5; second segment of fore tarsus about 1.3 as long as the third; frontal tubercle minute, conical, and about 1.5 as long as its basal diameter; median emargination of pronotum quite broad, slightly broader than in *G. paripes*; fore tarsus with a long sparse beard, or with a short sparse beard, or without a beard; scar-like mark at the base of the sixth tergite about 0.6 as long as the tergite and about 3.5 as long as the scar at the base of the second tergite.

Medium to dark fuscous brown and strongly pruinose. Thorax sometimes fuscous testaceous; wing veins dark; wing membrane seamed with pale gray along the veins; halter knob stramineous to fuscous; legs except coxae light yellowish brown marked with darker, sometimes mostly dark fuscous brown; abdomen with indistinct transverse pruinose bands.

Genitalia: Figure 159. Similar to those of *G. paripes* and *G. testaceus*; differing slightly from those of *G. barbipes* in that the inferior appendage is longer and more slender.

Female: Second segment of fore tarsus about 1.32 as long as the third. Otherwise similar to the male except for the usual sexual differences.

The above description applies to the typical form of the species. There is also a smaller variety of frequent occurrence which may possibly be a distinct species, but with series of specimens from numerous localities it seems impossible to distinguish it clearly. The smaller form seems to be a response to a different larval environment rather than to genetic differences. It differs from the typical form as follows: Wing 3.4 mm. long; antennal ratio 3.7; abdomen slightly broader, shorter, and with wider and more definite pruinose bands than in the typical form. I have also seen a few specimens of a small dark form with the scar-like impression of the sixth tergite shorter than normal. Since this material may represent a distinct species, it is not listed below.

I have examined a series of five males from England, determined as *Chironomus gripekoveni* Kieffer by Edwards, and believe them conspecific with American material.

Material: Many males and females from Alberta (Wabamun); Arkansas (Galloway); British Columbia (Duncan); Colorado (Peeetz); Connecticut (Canaan); District of Columbia (Washington); Florida (West Palm Beach); Illinois (Algonquin, Burlington, Lake Forest, and Momence); Iowa (Davenport and Lake Amana); Kansas (Lawrence, Little Gobi near Manhattan, Manhattan, and Pottawatomie County); Louisiana (Covington and Mount); Manitoba (Delta); Maryland (Blackwater Refuge at Cambridge and Plummers Island); Massachusetts (Amherst, Chicopee, and Holliston); Michigan (Allegan, Ann Arbor, Cheboygan County, Douglas Lake, East Lansing, Gladwin County, Grand Rapids, Hart, Isosco County, Isabella County, Isle Royal, Manistee County, Mason County, Midland County, St. Joseph River at Berrien Springs, Salt Fork at St. Joseph, and Stevensville); Minnesota (Anoka County, Cass Lake, Chisago County, Crystal Lake, Garden City, Hallack, Lake City, Lake Itasca, Pine City,

Ramsey County, St. Louis County, and Shakopee); Mississippi (Tupelo and Natchez); Missouri (Columbia and St. Louis); Montana (Big Timber); New Jersey (Moores-town); New York (Bemus Point, Canadago Lake, Canajoharie, Eagle Bridge, Fonda, Ithaca, Lake Charlotte, Mayville, McLean, Milford Center, Niskayuna, Old Forge, Otsego Lake, Rochester, Van Cortland Park, Westchester County, and Worlds Fair Grounds at Flushing); North Carolina (Raleigh and Wilmington); Ohio (Summit County); Oklahoma (Hinton, Okemah, Oklahoma City, Oswalt, and Roff); Ontario (Black Rapids in Rideau River, Cornwall, Grand Bend, Ottawa, Point Pelee, Point Ryerse, Prescott, Sand Lake, and Trenton); Oregon (Ontario) Quebec (Knowlton); Saskatchewan (Oxbow); South Dakota (Erwin, Mitchell, and Waubay); Texas (Brownsville and San Antonio); and Utah (10 miles south of Mt. Carmel, 9 miles north of Kanab, and Hooper). Adults are on the wing throughout the growing season, but are more common in the summer. They have been collected in Massachusetts from May 8 at Amherst to September 24 at Chicopee. This species is recorded (as *G. gripekoveni*) as common and widespread in Europe.

Subgenus GLYPTOTENDIPES

Glyptotendipes Kieffer, 1913, Biol. Zentralblatt **33**:255 (note). Genotype: *Glyptotendipes sigillatus* Kieffer (original designation).

Phytochironomus Kieffer, 1921, Ann. Soc. Sci. Bruxelles **40**, c. r.: 274 (no species included); Ann. Soc. Sci. Bruxelles **42**, m  m.: 79 (one species included). Genotype: *Phytochironomus aequalis* Kieffer (monobasic).

Female flagellum with 5 segments; frontal tubercles absent; abdominal tergites 3 to 6 each with a weak median basal scar-like impression.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS GLYPTOTENDIPES

1. Outer comb of middle tibia and inner comb of hind tibia without a spine; second segment of fore tarsus about 1.2 as long as the fore tibia; antennal ratio about 1.9; thorax slightly pruinose; color pale greenish stramineous.....164. *unacus*, new species
Both inner and outer combs of middle and hind tibiae each with a spine; second segment of fore tarsus about 0.55 to 0.8 as long as the fore tibia; antennal ratio about 2.5 to 4.0; thorax strongly pruinose.....2
2. Abdomen pale green; thorax stramineous to light brown, more or less stained with pale green (abdomen and thorax sometimes largely brownish in *G. senilis*, but never as dark as in *G. dreisbachi* and *G. seminole*).....3
Abdomen blackish brown; thorax brown, usually with some greenish stains.....4
3. Thorax about 1.36 as long as deep; fore tarsus of male with a short beard; wing about 3.0 mm. long.....160. *senilis* (Johannsen)
Thorax about 1.29 as long as deep; fore tarsus of male without a distinct beard; wing about 3.5 mm. long.....161. *amplus*, new species
4. Wing about 3.9 mm. long; leg ratio about 1.32; superior appendage of male genitalia stouter (fig. 162).....162. *dreisbachi*, new species
Wing about 2.3 mm. long; leg ratio about 1.6; superior appendage of male genitalia more slender (fig. 163).....163. *seminole*, new species

160. GLYPTOTENDIPES (GLYPTOTENDIPES) SENILIS (Johannsen)

Chironomus (*Glyptotendipes*) *senilis* (*Phytochironomus* group) Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. **210**:37; type localities: Canadago Lake, N. Y., and "near Hudson River," N. Y. (Cornell Univ.); description of larva, pupa, and adult.

Male: Wing 3.0 mm. long; leg ratio 1.5; antennal ratio 3.2; second segment of fore tarsus about 0.68 as long as the fore tibia; thorax 1.36 as long as deep; fore tarsus with a short beard.

Pale green (or sometimes the head and thorax strongly tinged with brown and the abdomen almost entirely brown). Pedicel, flagellum beyond the first segment, and mouthparts light brown; thorax strongly pruinose, its more heavily sclerotized parts stramineous to light brown; wing veins pale; halter knob greenish white; apices of femora and bases of tibiae tinged with brown; tarsi suffused with pale brown, darkest on the apical segments.

Genitalia: Similar to those of *G. seminole* (fig. 163) and, except for the slightly shorter anal point, also similar to those of *G. unacus* (fig. 164) and of *G. amplus*.

Female: Similar to the male except for the usual sexual differences.

Material: Many males and a few females from Iowa (Davenport); Michigan (Carp Lake in Emmet County); New York (Bemus Point, Canadarago Lake, Mayville, Milford Center, Otsego Lake, and Westchester County); and Ontario (Ottawa and Trenton). Specimens have been taken from June 19 in Westchester County, N. Y., to September 10 at Trenton, Ontario. Adults are often abundant around lakes and large rivers containing beds of aquatic weeds.

161. *Glyptotendipes (Glyptotendipes) amplus*, new species

Male: Wing 3.5 mm. long; leg ratio 1.45; antennal ratio 3.7; second segment of fore tarsus 0.68 as long as the fore tibia; thorax 1.29 as long as deep; fore tarsus with a very short indistinct beard.

Pale green, the thorax mostly pale brownish stramineous. Pedicel, flagellum beyond the first segment, and mouthparts light brown; thorax strongly pruinose; wing veins pale; halter knob greenish white; tarsi suffused with pale brown, darkest on the apical segments.

Genitalia: Similar to those of *G. unacus* (fig. 164), and, except for the slightly longer anal point, similar also to those of *G. seminole* (fig. 163) and of *G. senilis*.

Female: Similar to the male except for the usual sexual differences.

Type: Male, bank of Delaware River at Riverton, N. J., June 18, 1939, H. K. Townes (Townes).

Paratypes: Six males, 2 females, collected with the type (Townes); male, collected at the type locality, June 5, 1939, H. K. Townes (Townes).

162. *Glyptotendipes (Glyptotendipes) dreisbachi*, new species

Male: Wing 3.9 mm. long; leg ratio 1.32; antennal ratio 3.4; second segment of fore tarsus 0.59 as long as the fore tibia; thorax 1.34 as long as deep; fore tarsus with a moderately short beard.

Fuscous, the thorax not so dark as the abdomen. Thorax strongly pruinose; legs brown with the apices of the femora, bases and apices of the tibiae, and the tarsi darker brown; anterior wing veins brown, the rest pale; halter knob whitish.

Genitalia: Figure 162, drawn from the type. Superior appendage broader

than in other Nearctic species of the subgenus and the style perhaps slightly longer. Anal point of about the same length as in *G. amplus* and *G. unacus* (fig. 164).

Female: Similar to the male except for the usual sexual differences.

Type: Male, Missaukee County, Mich., May 29, 1939, R. R. Dreisbach (Townes).

Paratypes: Three males, 4 females, collected with the type (Townes, Dreisbach); male, 4 females, Missaukee County, Mich., July 6, 1940, August 30, 1941, and September 1, 1941, R. R. Dreisbach (Dreisbach, USNM); female, Third Sister Lake, Washtenaw County, Mich., November 17, 1941 (reared), C. O. Berg (Townes); male, Third Sister Lake, Washtenaw County, Mich., May 19, 1940, C. O. Berg (Townes); male, 3 pupal skins, and 3 larvae, Third Sister Lake, Washtenaw County, Mich., C. O. Berg (Townes). Additional specimens of larvae, pupae, and adults are in the collection of C. O. Berg. Mr. Berg tells me that the biology of this species is similar to that of *Glyptotendipes lobiferus* as reported by Leathers. It is a burrower in the stems of several species of *Potamogeton*.

163. *Glyptotendipes* (*Glyptotendipes*) *seminole*, new species

Male: Wing 2.3 mm. long; leg ratio 1.6; antennal ratio 2.7; second segment of fore tarsus 0.8 as long as the fore tibia; thorax 1.2 as long as deep; fore tarsus apparently without a distinct beard.

Fuscous, the thorax slightly paler than the abdomen. Thorax strongly pruinose; legs brown, with the knees, apices of the tibiae, and the tarsi darker brown; anterior wing veins brown, the rest pale; halter knob whitish.

Genitalia: Figure 163, drawn from the type. Similar to those of *G. senilis*, and, except for the slightly shorter anal point, also similar to those to *G. unacus* (fig. 164) and of *G. amplus*.

Female: Unknown.

Type: Male, Morrison (aviation) Field, West Palm Beach, Fla., October 2, 1942, D. E. Hardy (USNM).

Paratype: Male, Morrison Field, West Palm Beach, Fla., October 5, 1942, D. E. Hardy (USNM).

164. *Glyptotendipes* (*Glyptotendipes*) *unacus*, new species

Male: Wing 3.0 mm. long; leg ratio 1.8; antennal ratio 1.9; second segment of fore tarsus 1.2 as long as the fore tibia; thorax 1.25 as long as deep; fore tarsus with a short beard; outer comb of middle tibia and inner comb of hind tibia lacking a spine, the spine of the other two combs unusually long. (This is the only known member of the genus without a spine on each comb. The scar-like marks are not clearly distinguishable on the abdominal tergites of the single specimen before me, so the subgeneric position of the species is in doubt.)

Pale stramineous, the abdomen pale green. Flagellum beyond the basal segment light brown; thorax largely polished, the rest weakly pruinose.

Genitalia: Figure 164, drawn from the type. Similar to those of *G. amplus*, and, except for the slightly longer anal point, similar also to those of *G. seminole* (fig. 163) and of *G. senilis*.

Female: Unknown.

Type: Male, Norway Bay, Quebec, August 26, 1938, G. E. Shewell (CNC).

Genus HARNISCHIA

Palpus with 4 segments; male flagellum with 11, female with 5 segments; antennal ratio 1.7 to 4.0; frontal tubercles absent; pronotum tapered to the rather narrow center, usually with a weak and indistinct median notch, approximately even with or slightly surpassed by the anterior end of the mesoscutum; squamal fringe present, or, in *H. (H.) carinata* and in some species of the subgenus *Cladopelma*, absent; wing membrane without macrotrichia; fork of Cu beyond r-m; ends of R_1 and R_{4+5} slightly but distinctly separated; leg ratio 1.3 to 2.3; fore tibia with an inner apical low rounded scale which does not surpass a similar scale on the opposite side of the tibia; combs of middle and hind tibiae adjacent, often fused, with two spines or sometimes one spine on each pair of combs; pulvilli conspicuous lobes, entire.

Male genitalia: Anal point present; inferior appendage a small membranous lobe without macrotrichia, or absent; style and coxite ankylosed. See figures 165 to 201.

KEY TO THE SUBGENERA OF HARNISCHIA,

1. Superior appendage of male genitalia lobe-shaped, conspicuous, covered with microtrichia, and usually with a number of setae (figs. 165 to 174) *Cladopelma*, p. 147
- Superior appendage of male genitalia usually rod-shaped, with not more than two setae, and without microtrichia beyond its base (sometimes the superior appendage is reduced to a small lobe or to a very small unsclerotized flap, in which case it may be covered with microtrichia and have several setae, but it can not be confused with the well-developed superior appendage of the subgenus *Cladopelma* (figs. 175 to 201) *Harnischia*, p. 152

Subgenus CLADOPELMA

Cladopelma Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle 29: 63. Genotype: *Cladopelma laminata* Kieffer (by present designation).
Paracladopelma Harnisch, 1923, Zool. Jahrb. (Syst.) 47: 304. Genotype: *Tendipes camptolabis* Kieffer (original designation and monobasic).

End of M near wing apex, end of R_{4+5} somewhat farther away; tarsal beard absent; combs of middle and hind tibiae with one or two spines on each pair.

Male genitalia: Superior appendage lobe-like, covered with microtrichia, and usually with a number of macrotrichia. See figures 165 to 174.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS CLADOPELMA

1. Abdomen brown; wing 2.9 to 3.3 mm. long 2
- Abdomen green or mostly greenish; wing 1.3 to 2.5 mm. long 4

2. Combs of middle and hind tibiae with two spines (as normal); superior appendage of male genitalia very small, smaller than the inferior appendage and closely fused with it (fig. 165); antennal ratio about 3.0 165. *galaptera*, new name
- Combs of middle and hind tibiae with a single spine; superior appendage of male genitalia normal in size, as large as or larger than the inferior appendage and well separated from it (figs. 166 and 167); antennal ratio about 2.1 to 2.6 3
3. Ninth tergite of male genitalia shorter, without a longitudinal ridge (fig. 166) 166. *nixe*, new species
- Ninth tergite of male genitalia longer, with a weak longitudinal ridge (fig. 167) 167. *naïs*, new species
4. Combs of middle and hind tibiae with a single spine; male genitalia as in figure 174 174. *tethys*, new species
- Combs of middle and hind tibiae with two spines (as normal) 5
5. Style of male genitalia nearly straight in its apical half (figs. 168 and 169) 6
- Style of male genitalia evenly and strongly curved throughout (figs. 170 to 173) 7
6. Ninth tergite of male with a weak median longitudinal ridge; inferior appendage subtruncate apically (fig. 168) 168. *undine*, new species
- Ninth tergite of male without a median longitudinal ridge; inferior appendage usually narrow and rounded apically (fig. 169) 169. *nereis*, new species
7. Inferior appendage present as a distinct lobe 8
- Inferior appendage not present as a distinct lobe 9
8. Ninth tergite of male with a ridge extending backwards and inwards from each basal corner to meet near the middle of the tergite and extending backwards as a double ridge to near the base of the anal point (fig. 170) 170. *tylus*, new species
- Ninth tergite of male without distinct ridges as described above (fig. 171) 171. *doris*, new species
9. Apical part of superior appendage about 0.7 as wide as the median width of the style (fig. 172) 172. *amphitrite*, new species
- Apical part of superior appendage about 1.3 as wide as the median width of the style (fig. 173) 173. *orbiculus*, new species

**165. *Harnischia* (*Cladopelma*) *galaptera*, new name
for *C. CLARIPENNIS* Malloch**

Chironomus claripennis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:439; type locality: South Haven, Mich. (Ill.). Name preoccupied by Lundbeck, 1898.

Chironomus (*Chironomus*) *claripennis* (*Cladopelma* group) Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 20, 61, 62; biology.

Male: Wing 3.2 mm. long; leg ratio 1.5; antennal ratio 3.0; squama with a fringe of about 18 hairs; middle and hind tibiae with a pair of spines on each pair of combs.

Rather dark brown, the thorax strongly pruinose. Legs and flagellum brown; halter tinged with light brown; anterior wing veins light brown, the rest colorless.

Genitalia: Figure 165. The rather long, slender, evenly curved style, long anal point, and small superior appendage partially fused with the inferior appendage are diagnostic features.

Female: Similar to the male except for the usual sexual differences.

Material: Two males, Buffalo, N. Y., June 12, 1910, and October 13, 1910, M. C. Van Duzee (Calif. Acad.); male, Ithaca, N. Y., October (Cornell); male, Niagara Falls, N. Y., September 11, 1920, M. C. Van Duzee (Calif. Acad.); 7 males, 3 females, Costello Lake, Algonquin Park, Ont., May 30, 1937, to July 12, 1937, R. B. Miller (Miller, Townes); male, Orillia, Ont., June 28, 1926, C. H. Curran

(CNC). Edward's record of this species from England and Iceland (1929, Trans. Ent. Soc. London 77: 387) seems to be based on misdetermined material.

166. *Harnischia* (*Cladopelma*) *nixe*, new species

Male: Wing 3.0 mm. long; leg ratio 1.63; antennal ratio 2.1; squama with a fringe of about 9 hairs; middle and hind tibiae with a single spine on each pair of combs.

Blackish brown, the thorax strongly pruinose. Legs and flagellum brown; halter tinged with light brown; anterior wing veins brown, the rest stramineous.

Genitalia: Figure 166, drawn from type. Similar to those of *H. (C.) nais* (fig. 167) except that the apical part of the anal point is somewhat broader and that the ninth tergite is shorter and without a trace of a median carina.

Female: Unknown.

This may be possibly the same species as *H. (C.) nais*.

Type: Male, Estes Park, Colo., August 25, 1940, H. and M. Townes (Townes).

167. *Harnischia* (*Cladopelma*) *nais*, new species

Male: Wing 3.1 mm. long; leg ratio 1.7; antennal ratio 2.6; squama with a fringe of about 7 hairs; middle and hind tibiae with a single spine on each pair of combs.

Rather dark brown, the thorax pruinose. Legs and flagellum light brown; halter tinged with pale brown; anterior wing veins light brown, the rest colorless.

Genitalia: Figure 167, drawn from the type. Similar to those of *H. (C.) nixe* (fig. 166) except that the apical part of the anal point is somewhat narrower and that the ninth tergite is longer and has a weak longitudinal carina.

Female: Unknown.

This species is possibly the same as *H. (C.) nixe*.

Type: Male, Ithaca, N. Y., May, 1939 (Townes).

168. *Harnischia* (*Cladopelma*) *undine*, new species

Male: Wing 1.9 mm. long; leg ratio 1.8; antennal ratio 2.0; squama fringed with 0 to 4 hairs; middle and hind tibiae with two spines on each pair of combs.

Pedicle and thorax pale brown; abdomen pea green, darker at the incisures and brownish beyond the fifth segment; flagellum and mouthparts brown; legs stramineous, brown towards their apices; scutellum and certain other thoracic areas green; wing veins pale brown; halter pale green.

Genitalia. Figure 168. Closely similar to those of *H. (C.) nereis* (fig. 169) but with the ninth tergite slightly longer and with a weak median longitudinal

carina; the apical part of the anal point slightly narrower, and the inferior appendage usually subtruncate apically.

Female: Unknown.

Type: Male, Snake River at Ontario, Oreg., August 21, 1940, H. and M. Townes (Townes).

Paratypes: Male, Farmingdale, N. Y., July 3, 1938, H. K. Townes (Townes); 3 males, Westchester County, N. Y., June 19, 1936, H. K. Townes (Townes); male, Costello Lake, Algonquin Park, Ontario, July 18, 1937, R. B. Miller (Townes); and 2 males collected with the type (Townes).

169. *Harnischia (Cladopelma) nereis*, new species

Male: Wing 1.9 mm. long; leg ratio 1.9; antennal ratio 2.1; squama fringed with 2 to 6 hairs; middle and hind tibiae with two spines on each pair of combs.

Pedicle and thorax pale brown; abdomen pea green, darker at the incisures and tinged with brown beyond the fifth segment; flagellum and mouthparts brown; legs stramineous, brown towards their apices; scutellum and certain other thoracic areas green; wing veins pale brown; halter pale green.

Genitalia: Figure 169. Closely similar to those of *H. (C.) undine* (fig. 168) but with the ninth tergite slightly shorter and without a trace of a median longitudinal carina, the apical part of the anal point usually broader, and the inferior appendage usually narrower and rounded apically.

Female: Similar to the male except for the usual sexual differences.

Type: Male, west bank of Saluda River 0.3 mile below bridge on highway between Greenville, S. C., and Easley, S. C. (S. C. route 13), June 20, 1940, H. K. Townes (Townes).

Paratypes: Male, Sandpoint, Idaho, July 3, 1917, H. G. Dyar (USNM); male, La Fayette, Ind., August 31, 1917, J. M. Aldrich (USNM); male, Gloversville, N. Y., July 25, 1934, H. K. Townes (Townes); male, Hoosick, N. Y., September 4, 1934, H. K. Townes (Townes); male, Ithaca, N. Y., September 18, 1938, H. K. Townes (Townes); male, Trout Run, Pa., May 29, 1938, H. K. Townes (Townes); and 5 males, 1 female, taken with the type (Townes).

170. *Harnischia (Cladopelma) tylus*, new species

Male: Wing 1.5 mm. long; leg ratio 1.85; antennal ratio 2.1; squama without a fringe of hairs; middle and hind tibiae with a pair of spines on each pair of combs.

Antenna and thorax pale brown; scutellum pale green; legs stramineous; anterior wing vein stramineous, the rest colorless; halter whitish; abdomen light green. Apical part of abdomen probably brownish, but the color of this part of the type was not observed before it was made into a genitalia slide.

Genitalia: Figure 170, drawn from the type. The ridges on the ninth tergite are distinctive.

Female: Unknown.

Type: Male, Indianapolis, Ind., July 22, 1928, C. F. Adams (Johannsen).

171. *Harnischia* (*Cladopelma*) *doris*, new species

Male: Wing 1.35 mm. long (1.65 mm. long in paratypes); leg ratio 1.6 (2.5 in paratypes); antennal ratio 1.9; squama without a fringe of hairs; middle and hind tibiae with two spines on each pair of combs.

Head and antenna light brown; thorax greenish, with the sclerites ochraceous or light brown; legs stramineous; anterior wing veins stramineous, the rest colorless; halter pale green; abdomen pea green, darker at the incisures. Apical part of abdomen brownish.

Genitalia: Figure 171, drawn from the type. The superior appendage is deeply divided into a bare dorsal lobe and a setiferous ventral lobe, the dorsal lobe overlying the ventral lobe and the ventral lobe closely overlying the inferior appendage, so that it is difficult to represent all three structures in a drawing.

Female: Unknown.

Type: Male, Gore, Okla., August 28, 1940, H. and M. Townes (Townes).

Paratypes: Male, Davenport, Iowa, August 1, 1942, U. A. Hauber (Hauber); male, Davenport, Iowa, August 14, 1942, U. A. Hauber (USNM).

172. *Harnischia* (*Cladopelma*) *amphitrite*, new species

Male: Wing 2.4 mm. long; leg ratio 1.45; antennal ratio 2.6; squama with a fringe of about 8 hairs; middle and hind tibiae with a pair of spines on each pair of combs.

Stramineous. Pedicel and thoracic sclerites light orange-brown; palpus, flagellum beyond the first segment, and legs towards their apices brown.

Genitalia: Figure 172. The narrowly foot-shaped superior appendage, together with the shape of the style and of the ninth tergite with its subapically attached anal point, is distinctive.

Female: Unknown.

Type: Male, American Island (in the Missouri River), Chamberlain, S. Dak., June 26, 1940, H. and M. Townes (Townes).

Paratype: Two males, collected with the type (Townes).

173. *Harnischia* (*Cladopelma*) *orbicus*, new species

Male: Wing 2.3 mm. long; leg ratio ? (fore tarsi of type lacking); anten-

nal ratio 2.3; squama with a fringe of about 8 hairs; middle and hind tibiae with 2 pairs of spines on each pair of combs.

Head and thorax ochraceous; palpus and flagellum beyond its base light brown; wing veins stramineous, the anterior veins slightly darker than the posterior veins; halter and legs stramineous; apices of tarsi brown (front tarsi of type lacking); front tibia brownish, darkest towards its apex; abdomen light green.

Genitalia: Figure 173, drawn from the type. The shapes of the style and of the superior appendage are together distinctive.

Female: Unknown.

Type: Male, Douglas County, Kans., September 16, 1921, W. J. Brown (Kans.).

174. *Harnischia* (*Cladopelma*) *tethys*, new species

Male: Wing 1.7 mm. long; leg ratio 2.1; antennal ratio 1.9; squama without a fringe of hairs, or sometimes with a single hair; middle and hind tibiae with a single spine on each pair of combs. The tibial combs differ from those of other known members of the subgenus in that the inner combs (which alone bear spines) are considerably longer than the outer combs.

Head and antenna light brown; thorax light brown with the scutellum and certain other areas greenish; legs light brown more or less tinged with green, darker brown towards their apices; anterior wing veins light brown, the rest pale brown; halter pale green; abdomen light pea green, the apical part brownish green.

Genitalia: Figure 174, drawn from the type.

Female: Unknown.

Type: Male, American Island (in the Missouri River), Chamberlain, S. Dak., June 26, 1940, H. and M. Townes (Townes).

Paratypes: Two males, collected with the type (Townes).

Subgenus HARNISCHIA

Harnischia Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle **29**:69. Genotype: *Harnischia fuscimanus* Kieffer (monobasic).

Kribiocryptus Kieffer, 1921, Ann. Soc. Ent. France **90**: 28, 44. Genotype: *Kribiocryptus flaviventris* Kieffer (by present designation). New synonymy.

Parachironomus Lenz, 1921, Deutsch. Ent. Ztschr. **1921**: 160. Genotype: *Chironomus cryptotomus* Kieffer (by present designation). New synonymy.

Leptochironomus Pagast, 1931, Folia Zoologica et Hydrobiologica **3**: 208, 210, 216. Genotype: (*Chironomus* (*Leptochironomus*) *balticus* Pagast)=*tener* (Kieffer) (by present designation). New synonymy.

Dychironomus Lenz, 1941, Zool. Anz. **133**:35. Genotype: *Chironomus biannulatus* Staeger (monobasic). New synonymy.

Paraharnischia Lenz, 1941, Zool. Anz. **133**:36. Genotype: (*Cryptochironomus bacilliger* Kieffer)=*tenuicaudata* (Malloch). New synonym.

Cryptocladopelma Lenz, 1941, Zool. Anz. 133:37. Genotype: *Chironomus* (*Cryptochironomus*) *lateralis* Goetghebuer (by present designation). New synonymy.

Ends of M and R_{4+5} equidistant from wing apex or the end of R_{4+5} slightly farther away; tarsal beard present or absent; combs of middle and hind tibiae with two spines on each pair.

Male genitalia: Superior appendage rod-shaped with usually two apical setae, the apical part variously shaped; often the superior appendage much reduced in length, sometimes to a tiny unsclerotized lobe. See figures 175 to 201.

KEY TO THE NEARCTIC SPECIES OF THE SUBGENUS HARNISCHIA

1. Squama without a marginal fringe of long hairs; spines on combs of hind tibia very close together, the inner spine almost twice as long as the outer one (fig. 258); wing length about 1.9 mm. 181. *carinata*, new species
- Squama with a marginal fringe of long hairs; spines on combs of hind tibia more widely separated and nearly equal in length. 2
2. Second segment of fore tarsus mostly or entirely pure white; fore tarsus of male with a long beard 3
- Second segment of fore tarsus brown to dirty white with the ends brown; fore tarsus of male usually without a beard 4
3. Apical part of fore tibia brown; second segment of fore tarsus brown at the ends; apices of first and second segments of middle and hind tarsi dark brown. (Some specimens of *H. albobiridis* may run here. They may be distinguished from *H. frequens* by the strongly pruinose thorax, lack of beard on the fore tarsus of the male, and entirely different male genitalia.) 175. *frequens* (Johannsen)
- Apical part of fore tibia pale, not darker than the rest of the tibia; second segment of fore tarsus entirely white; apices of first and second segments of middle and hind tarsi pale, not darker than the basal parts of the segments 177. *elodeae*, new species
4. Superior appendage of male genitalia more than half as long as the anal point. (*H. nigrovittata* and *H. casuarina* are intermediate in this character and are keyed out both ways.) 5
- Superior appendage of male genitalia less than half as long as the anal point. 14
5. Apical 0.4 of style of male genitalia strongly curved, the basal 0.6 approximately straight (figs. 185 and 186) 6
- Apical 0.4 of style of male genitalia not more strongly curved than the basal 0.6. 7
6. Ninth tergite of male with a large high median ridge that appears from the side like a semicircular lamella (fig. 186B) 186. *casuarina*, new species
- Ninth tergite without such a ridge. 185. *emorsa*, new species
7. Basal 0.3 to 0.7 of style attenuate, much narrower than the apical part (figs. 179, 183, and 184) 8
- Basal part of style not attenuate, not conspicuously narrower than the apical part. 10
8. Style stout, banana-shaped (fig. 179); second tarsal segment whitish except at the base and apex, distinctly paler than the third segment and the apex of the first 179. *vara* (Goetghebuer)
- Style slender, not as above (figs. 183 and 184); second tarsal segment not paler than the third or the apex of the first 9
9. Apical 0.5 of style broad, the basal 0.5 more slender; superior appendage not reaching the apex of the anal point (fig. 183); leg ratio about 1.7 183. *monochromus* (Wulp)
- Apical 0.3 of style broad, the basal 0.7 more slender; superior appendage reaching the apex of the anal point (fig. 184); leg ratio about 1.4 184. *tenuicaudata* (Malloch)
10. Style with a subbasal mesal swelling; ninth tergite with a setiferous tubercle on

- each side of the anal point (fig. 189); wing length about 1.5 mm.; thorax heavily marked with blackish189. *nigrovittata* (Malloch)
- Style without a subbasal mesal swelling; ninth tergite without a setiferous tubercle on each side of the anal point; wing length 1.7 to 4.4 mm.; thorax rarely marked with blackish11
11. Apical 0.3 of style narrowed and directed inward (fig. 178); leg ratio 1.2 to 1.4178. *forceps*, new species
- Apical 0.3 of style not narrowed or directed inward; leg ratio 1.3 to 1.9.....12
12. Style clavate (fig. 180); apical part of superior appendage directed inward; abdomen brown.....180. *claviger*, new species
- Style sublinear (figs. 176 and 182); apical part of superior appendage not directed inward; abdomen green.....13
13. Style distinctly curved (fig. 176); central part of second segment of fore tarsus usually whitish and distinctly paler than the third segment and apex of the first.....176. *abortiva* (Malloch)
- Style almost straight (fig. 182); central part of second segment of fore tarsus neither whitish nor distinctly paler than the third segment or apex of the first.....182. *potamogeti*, new species
14. Lateral apical corner of male ninth tergite produced into an acute-pointed process (figs. 193 and 197).....15
- Lateral apical corner of male ninth tergite not produced, more or less rounded.....16
15. Lateral point-like process of ninth tergite mesad of base of style, adjacent to base of anal point (fig. 193); thorax strongly pruinose; apices of tibiae and of the two basal tarsal segments conspicuously darker than the rest of the segments.....193. *alboviridis* (Malloch)
- Lateral point-like process of ninth tergite overlying base of style, well separated from base of anal point (fig. 197); thorax not strongly pruinose; apices of tibiae and of the two basal tarsal segments not conspicuously darkened.....197. *spectabilis*, new species
16. Ninth tergite of male with a large high median ridge that appears from the side like a semicircular lamella (fig. 186B).....186. *casuarina*, new species
- Ninth tergite without such a ridge17
17. Ninth tergite of male with a longitudinal row of bristles on each side of the midline which arch toward the midline; fused style and coxite long, curved, and rather slender toward the base (figs. 198 to 201).....18
- Ninth tergite of male without bristles as above, though with patches of bristles near the base of the anal point and often with lateral patches also; style and coxite not as above21
18. Ninth tergite with a hood-like swelling over the base of the anal point (fig. 201).....201. *galeator*, new species
- Ninth tergite not extended over the base of the anal point.....19
19. Ninth tergite extended as a large shoulder on each side of the anal point (fig. 200)200. *collator*, new species
- Ninth tergite not extended as a large shoulder on each side of the anal point.....20
20. Posterior half of ninth tergite and basal part of anal point with a median, longitudinal, high, thin, knife-like carina; anal point broader (fig. 199).....199. *viridulus* (Linnaeus)
- Posterior half of ninth tergite and basal part of anal point without such a carina; anal point narrower (fig. 198).....198. *amachaerus*, new species
21. Lateral apical corner of ninth tergite strong, forming a rounded right angle, and with a patch of bristles (fig. 196).....196. *edwardsi* (Krusenman)
- Lateral apical corner of ninth tergite weak, much more obtuse than a right angle, and usually without bristles22
22. Style at its middle somewhat narrowed and strongly curved (fig. 190).....190. *pseudotener* (Goetghebuer)
- Style at its middle not narrowed and less strongly curved.....23

23. Superior appendage not or very little more than 1.0 as long as broad; apical part of anal point expanded and flat above (figs. 194 and 195).....24
 Superior appendage more than 2.0 as long as broad; apical part of anal point not expanded and flat above.....25
24. Style and coxite separated by a strong constriction (fig. 194).....194, *incidata*, new species
 Style and coxite not separated by a strong constriction (fig. 195).....195, *curtilamellata* (Malloch)
25. Basal part of anal point simple, abruptly widened into the rest of the ninth tergite (figs. 191 and 192).....26
 Basal part of anal point wedge-shaped, not clearly set off from the rest of the ninth tergite.....27
26. Wing length about 4.5 mm.; hairs between median and lateral lobes of meso-scutum arranged in a quadruple row.....191, *argentea*, new species
 Wing length about 2.6 mm.; hairs between median and lateral lobes of meso-scutum arranged in a single or double row.....192, *grisea* (Malloch)
27. Thorax heavily marked with blackish; leg ratio about 1.35; wing length about 1.5; genitalia as in figure 189.....189, *nigrovittata* (Malloch)
 Thorax not marked with blackish; leg ratio 1.55 to 1.8; wing length 2.5 to 3.5 mm.; genitalia as in figures 187 and 188.....28
28. Basal 0.4 of anal point wedge-shaped; style longer (fig. 187).....187, *fastigata*, new species
 Basal 0.7 of anal point wedge-shaped; style shorter (fig. 188).....188, *cuneata*, new species

175. *Harnischia* (*Harnischia*) *frequens* (Johannsen),
 new combination

Chironomus frequens Johannsen, 1905, Bull. N. Y. State Mus. 86:230; type locality: Ithaca, N. Y. (Johannsen collection).

Chironomus frequens Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:452; description.

Cryptochironomus longiforceps Kieffer, 1921, Bull. Soc. d'Hist. Nat. Moselle 29:66; type locality: Silesia (location of type unknown). New synonymy.

Male: Wing 3.3 mm. long; leg ratio 1.35; antennal ratio 3.0; front tarsus with a rather long, but sparse and ragged beard.

Pale green. Pedicel and most of thorax ochraceous; palpus and flagellum except its basal part infusate; legs yellowish green, the apical 0.3 of fore tibia and extreme apices of middle and hind tibiae brown; tarsi white, brown on the apical 0.3 of fore basitarsus, basal 0.05 and apical 0.12 of second segment and all of third segment of fore tarsus, apical 0.1 to 0.3 of first to third segments of middle and hind tarsi, and all of the fourth and fifth tarsal segments. The brown leg markings in this species are more intensive and contrasted than in any other species of the subgenus.

Genitalia: Figure 175. The broad, long, and bristly anal point and the long relatively straight style are distinctive.

Female: Similar to the male except for the usual sexual differences.

I have not seen European specimens, but the descriptions of *longiforceps* Kieffer by European authors seem certainly to apply to the present species.

Material: Many males and females from Iowa (Davenport); Illinois (Burlington, Havana, and Peoria); Kansas (Lawrence); Michigan (Berrien Springs and South

Haven); New York (Camelot, Canajoharie, Croton Reservoir, Germantown, Herkimer, Ithaca, Milford Center, Oneonta, Poughkeepsie, Rhinecliff, and Shokan); Oklahoma (Oklahoma City); Ontario (Ottawa); Oregon (Klamath Lake); and Quebec (Coteau du Lac). Adults are common throughout the summer. They have been collected from June 15 at Peoria, Ill., to September 16 in Douglas County, Kans. The species apparently breeds only in larger bodies of water. It is common and widespread also in Europe.

176. *Harnischia* (*Harnischia*) *abortiva* (Malloch),
new combination

Chironomus abortivus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:465; type locality: Urbana, Ill. (Ill.).

Chironomus (*Cryptochironomus*) *parilis* var. *abortivus* (*Parachironomus* group) Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:39; synonymy, description of larva and pupa.

Chironomus abortivus Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 171; biology.

Male: Wing 3.0 mm. long; leg ratio 1.4; antennal ratio 3.1; front tarsus with a rather short, sparse, and ragged beard.

Pale green. Pedicel, most of thorax and palpus ochraceous; flagellum except basal part infuscate; apical 0.1 of fore tibia brown; tarsi whitish, brown on the apical 0.12 of fore basitarsus, basal 0.1 and apical 0.25 of the second segment and all of the third segment of the fore tarsus, and all of the fourth and fifth tarsal segments. The white of the second segment of the fore tarsus is tinged with brown (rarely this segment is entirely brown), and the apical 0.1 to 0.25 of the second and third segments of the middle and hind tarsi are sometimes tinged with pale brown.

Genitalia: Figure 176. Rather similar to those of *H. (H.) elodeae* (fig. 177), especially in the shape of the superior appendage.

Female: Similar to the male except for the usual sexual differences.

The European *parilis* (Walker) is probably the same as this species, but the figures by European authors are not accurate enough to make this certain. I have studied an incomplete male from England, determined as *Chironomus parilis* by Edwards, but was unable to come to a conclusion from the study of this single specimen.

Material: Many males and females from Illinois (Burlington and Urbana); Iowa (Davenport); Minnesota (Ramsey County); New York (Ashokan Reservoir, Barrytown, Bemus Point, Camelot, Canadarago Lake, Canajoharie, Germantown, Herkimer, Poughkeepsie, Rhinecliff, and Westchester County); Oklahoma (Oklahoma City); Ontario (Ottawa); and South Dakota (Michell). Three specimens from Klamath Falls, Oreg. (Townes, Jewett, Oregon), are darker than normal and with the second segment of the fore tarsus brown. Adults are common around larger bodies of water throughout the summer. They have been collected from June 18 at Davenport, Iowa, to September 5 at Urbana, Ill.

177. *Harnischia* (*Harnischia*) *elodeae*, new species

Male: Wing 3.7 mm. long; leg ratio 1.25; antennal ratio 3.4; fore tarsus with a long beard.

Pale green. Pedicel light brown; thorax tinged with ochraceous; palpus and flagellum except base infuscate; tarsi whitish, marked with brown as follows: Apical 0.2 of fore basitarsus, third segment of fore tarsus, segments 4 and 5 of all tarsi, and apical 0.3 of third segment of middle and hind tarsi.

Genitalia: Figure 177, drawn from the type. Rather similar to those of *H. (H.) abortiva* (fig. 176), especially in the shape of the superior appendage.

Female: Similar to the male except for the usual sexual differences.

Type: Male, at the head of Goodyear Lake, Milford Center, N. Y., July 13, 1935, H. K. Townes (Townes).

Paratypes: Male, collected with the type (Rempel); female, Bemus Point, N. Y., July 24, 1937, H. K. Townes (Townes); female, Shokan, N. Y., July 9, 1936, H. K. Townes (Townes).

178. *Harnischia (Harnischia) forceps*, new species

Male: Wing 3.1 mm. long; leg ratio 1.3; antennal ratio 3.0; fore tarsus without a beard.

Pale green, sometimes slightly infuscate. Pedicel and thoracic markings brown to pale greenish ochraceous; flagellum and palpus light brown; legs stramineous brown to pale green, darker brown as follows: April 0.1 of fore tibia, apical $0.25 \pm$ of first segment of fore tarsus and first three segments of middle and hind tarsi, and all of last two segments of fore tarsus and last three segments of middle and hind tarsi; second segment of fore tarsus whitish to pale brown, darker on its basal and apical $0.25 \pm$.

Genitalia: Figure 178. Similar to those of *H. (H.) vara* (fig. 179) but the style not so slender at the base.

Female: Unknown.

Type: Male, Hatch Experiment Station, Amherst, Mass., May 1898 (Mass.).

Paratypes: Male, collected with the type (Townes); male, Churchill, Manitoba, August 2 to 9, 1937, D. G. Denning (Minn.); male, Osceola County, Mich., June 4, 1940, R. R. Dreisbach (USNM). The type and paratype are much darker than the other specimens, probably due to development very early in the season.

179. *Harnischia (Harnischia) vara* (Goetghebuer), new combination

Chironomus varus Goetghebuer, 1921, Mem. Mus. Hist. Nat. Belgique 31 (vol. 8, fasc. 4): 42, 162; type locality: Destelbergen, Heusden, and Afsné in Belgium (location of type unknown).

Male: Wing 2.5 mm. long; leg ratio 1.3; antennal ratio 2.3; fore tarsus with a very short beard.

Pea green, the legs paler. Pedicel, flagellum except its base, and palpus

brown; legs light brown as follows: Apical 0.1 of tibiae and first and second tarsal segments (paler on the middle and hind tarsi), and apical three segments of all tarsi. The third segment of the middle and hind tarsi may be more or less pale.

Genitalia: Figure 179. Similar to those of *H. (H.) forceps* (fig. 178), but the basal third of the style more slender. The shape of the style makes this species easy to recognize.

Female: Similar to the male except for the usual sexual differences.

I have not seen European material, but the present specimens agree with the descriptions by European authors.

Material: Two males, Churchill, Manitoba, August 2 to 9, 1937, D. G. Denning (Minn. and Townes); male, Hudson, N. Y., August 31, 1936, H. K. Townes (Townes). The species is found also in northwestern Europe.

180. *Harnischia (Harnischia) claviger*, new species

Male: Wing 1.9 mm. long; leg ratio 1.8; antennal ratio 2.2; fore tarsus without a beard.

Thorax pea green with the sclerites brownish orange; abdomen olive green at the base, darkening to brown toward the apex; pedicel orange brown; palpus and flagellum infuscate; legs stramineous, brown toward their apices; apex of front femur and basal and apical parts of front tibia brownish.

Genitalia: Figure 180, drawn from the type. The clavate style, superior appendage directed inward at its apex, and shape of the ninth tergite render this species very distinct.

Female: Unknown.

The European *demeijeri* (Kruseman) is similar to this species; but, according to Kruseman's description and figure, there are significant differences in the leg and antennal ratios and in the male genitalia.

Type: Male, west bank of Saluda River 0.3 mile below bridge on highway between Greenville, S. C., and Easley, S. C. (South Carolina route 13), June 20, 1940, H. K. Townes (Townes).

Paratypes: Two males, collected with the type (Townes); male, La Fayette, Ind., May 1918, J. M. Aldrich (USNM); male, Nebraska (Cornell); male, Columbia River at Orondo, Wash., July 2, 1940, H. K. Townes (Townes).

181. *Harnischia (Harnischia) carinata*, new species

Male: Wing 1.9 mm. long; leg ratio 2.0; antennal ratio 2.0; fore tarsus without a beard. This species differs from all others of its genus known to me in lacking a marginal fringe of hairs on the squama and in having the spines of the tibial combs very close together and unequal in length. On the hind tibia the inner spine is nearly twice as long as the outer one (fig. 258).

Pea green, the pedicel and thoracic sclerites more or less ochraceous. Palpus ochraceous brown; flagellum infusate except at its base; legs paler green than the body, pale brown toward the apices of the tarsi.

Genitalia: Figure 181. The truncate end of the ninth tergite, setiferous longitudinal ridge on the ninth tergite, and spatulate style (as seen from the side) distinguish this species.

Female: similar to the male except for the usual sexual differences.

Type: Male, cypress pond at Galloway, Ark., August 28, 1940, H. K. Townes (Townes).

Paratypes: Six males, 1 female, collected with the type (Townes); 9 males, 3 females, West Palm Beach, Fla., September 20, 1942, September 29, 1942, October 5, 1942, October 6, 1942, and October 30, 1942, D. E. Hardy (USNM); male, Indianapolis, Ind., August 26, 1928, C. F. Adams (Johannsen); 3 males, Davenport, Iowa, July 30, 1942, August 14, 1942, and August 17, 1942, U. A. Hauber (Hauber); male, Medford Lakes, N. J., June 3, 1939, H. K. Townes (Townes); male, Kinderhook, N. Y., August 31, 1934, H. K. Townes (Townes); and male, Falls Church, Va., June 10, N. Banks (Harvard).

182. *Harnischia (Harnischia) potamogeti*, new species

Male: Wing 2.7 mm. long; leg ratio 1.6; antennal ratio 2.7; fore tarsus without a beard.

Pale whitish green, the pedicel and thoracic sclerites pale ochraceous or sometimes fuscous. Flagellum beyond the first segment and palpus brownish; tarsi brown toward the apex, the apical segment dark brown.

Genitalia: Figure 182. The style as seen from the side is slightly enlarged near the apex and obliquely truncate. The superior appendage has an apical lateral tooth, not showing well in the specimen figured.

Female: Similar to the male except for the usual sexual differences.

Type: Male, Mayville at the head of Chautauqua Lake, N. Y., July 27, 1937, H. K. Townes and G. E. Burdick (Townes).

Paratypes: Fourteen males, collected with the type, and 70 males, 2 females, from the District of Columbia (Washington); Florida (West Palm Beach); Louisiana (Schriever); Manitoba (Aweme); Maryland (Plummers Island); Michigan (Bay County and Midland County); Mississippi (Bay St. Louis); New Jersey (Moorestown and Riverton); New York (Bemus Point, Canadarago Lake, Germantown, Ithaca, Kingston, Milford Center, Newport, North Fairhaven, Otsego Lake, Poughkeepsie, Rome, Valley Falls, Westchester County, and West Galway); Ontario (Costello Lake in Algonquin Park and Ottawa); Pennsylvania (Philadelphia); Quebec (Batiscan); and Texas (Brownsville). Paratypes are in the collections of Townes, Rempel, Cornell, United States National Museum, Miller, Harvard, Canadian National Collection, and Dreisbach. Adults may be collected around larger

bodies of water throughout the growing season, most abundantly in summer. Collection dates are from April 30 in Midland County, Mich., to September 18 at Ithaca, N. Y.

183. *Harnischia* (*Harnischia*) *monochromus* (Wulp),
new combination

Chironomus unicolor Wulp, 1858, Tijdschr. Ent. 2: 5; type locality: Netherlands (location of type unknown); name preoccupied by Walker 1848.

Chironomus monochromus Wulp, 1874, Tijdschr. Ent. 17:129; new name for *C. unicolor* Wulp.

Chironomus tenuicaudatus Fellton, 1940, Jour. Econ. Ent. 33:252-263; biology, mis-determination of *tenuicaudatus* Malloch.

Male: Wing 2.1 mm. long; leg ratio 1.7; antennal ratio 2.45; fore tarsus without a beard.

Pale green. Pedicel and thorax pale ochraceous; flagellum beyond the base and palpus somewhat infuscate; fore tarsus and apical part of fore tibia light brown; all tarsi brown towards the apex.

Genitalia: Figure 183. Intermediate between those of *H. (H.) potamogeti* (fig. 182) and *H. (H.) tenuicaudata* (fig. 184).

Female: Similar to the male except for the usual sexual differences.

I have had no European material for comparison.

Material: Four males, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes); male, Worcester, Mass. (Cornell); 4 males, Medford Lakes, N. J., June 17, 1939, H. K. Townes (Townes); male, Haverstraw, N. Y., August 24, 1936, H. K. Townes (Townes); 8 males, 2 females, Peekskill Bay at Peekskill, N. Y., July 6, 1941, H. K. Townes (Townes); 5 males, Worlds Fair Grounds at Flushing, N. Y., 1938 and August 1938, H. L. Fellton (USNM). The species is widespread in Europe.

184. *Harnischia* (*Harnischia*) *tenuicaudata* (Malloch),
new combination

Chironomus modestus var. b, Johannsen, 1905, Bull. N. Y. State Mus. 86:228; description of pupa and adult.

Chironomus tenuicaudatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:475; type locality: Havana, Ill. (Ill.).

Cryptochironomus bacilliger Kieffer, 1922, Ann. Soc. Sci. Bruxelles 41:358; type locality: Etang Woltersteich, Schleswig-Holstein (location of type unknown). New synonymy.

Chironomus (Chironomus) tenuicaudatus (Parachironomus group) Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:21; generic position.

Chironomus (Limnochironomus) tenuicaudatus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:43; description of larva and pupa.

Chironomus (Limnochironomus) tenuicaudatus Beyer, 1941, Iowa non-biting midges (mimeographed), p. 3; biology.

Chironomus (Chironomus) tenuicaudatus Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:61, 62; biology.

Male: Wing 2.2 mm. long; leg ratio 1.4; antennal ratio 2.35; fore tarsus without a beard.

Pale green. Head and thorax mostly ochraceous; pedicel and mouthparts ochraceous; flagellum beyond the base infuscate; fore tarsus and apical part of fore tibia light brown; all tarsi brown toward the apex.

Genitalia: Figure 184. The very long slender style and superior appendage are distinctive, but this species is easily confused with *H. (H.) monochromus* (fig. 183).

Female: Similar to the male except for the usual sexual differences.

The name *baciliger* Kieffer is synonymized after a study of the descriptions and figures given by European authors.

Material: Many males from Illinois (Havana); Iowa (Davenport); Kansas (Pratt County at 1,900 ft.); Massachusetts (South Hadley); Michigan (Bay County); Minnesota (Chisago County and St. Paul); Missouri (Atherton); New Jersey (Medford Lakes and Moorestown); New Mexico (Torrance County); New York (Croton Reservoir, Haverstraw, Ithaca, Kensico Reservoir, Mahopac Lake, Niskayuna, Peekskill, Poughkeepsie, and Scarborough); Ohio (Summit County); Ontario (Costello Lake in Algonquin Park); Oregon (Takenitch Lake); and Saskatchewan (Attens Lake at Cut Knife). Adults may be collected around larger bodies of water throughout the growing season. Collection dates are from April 15 at Atherton, Mo., to September 7 in Bay County, Mich. The species is recorded from many localities in Europe under the name *baciliger* Kieffer.

185. *Harnischia (Harnischia) emorsa*, new species

Chironomus fulvus Johannsen, 1905, Bull. N. Y. State Mus. 86:224; description of pupa (misdetermined).

Chironomus (Limnochironomus) sp. Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:44; description of pupa.

Male: Wing 2.0 mm. long; leg ratio 2.4; antennal ratio 2.4; fore tarsus without a beard.

Pea green. Thoracic sclerites ochraceous or sometimes brown; pedicel ochraceous to brown; legs pale greenish ochraceous, brownish toward the apex; front tibia and tarsus and apex of front femur light brown; styles whitish green.

Genitalia: Figure 185, drawn from the type. The shape of the style is rather similar to that of *H. (H.) casuaria* (fig. 186A), but the ninth tergite lacks the casque-like ridge (fig. 186B).

Female: Unknown.

Type: Male, Ithaca, N. Y., June 6, 1935, H. K. Townes (Townes).

Paratypes: Four males, collected with the type (Townes, Rempel); male, Ithaca, N. Y. (Cornell); male, Ithaca, N. Y., May 20, 1937, J. G. Rempel (Rempel); 4 males, Ithaca, N. Y., September 12, 1938, H. K. Townes (Townes); 2 males, Germantown, N. Y., June 22, 1936, H. K. Townes (Townes); 2 males, Washington, D. C., July 8, R. P. Currie (USNM); 4 males, Riverton, N. J., June 5, 1939, H. K. Townes (Townes); male, Summit County, Ohio, August 18, 1937, Louis J. Lipovsky (Kans.); male, Davenport, Iowa, May 5, 1941, U. A. Hauber (Hauber). Professor U. A. Hauber has

reared this species and tells me that the pupa fits Johannsen's description of *Chironomus* (*Limnochironomus*) sp. (cited above).

186. *Harnischia* (*Harnischia*) *casuaria*, new species

Chironomus (*Microchironomus*) sp. 1, Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 172; biology.

Chironomus (*Chironomus*) sp. b, Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:61, 63; biology.

Male: Wing 1.8 mm. long; leg ratio 1.6; antennal ratio 2.35; fore tarsus without a beard.

Pea green. Thoracic sclerites ochraceous or brown; pedicel ochraceous; flagellum beyond the base and palpus brown; legs pale greenish ochraceous, brownish toward the apex; front tibia and tarsus and apex of front femur light brown; style whitish green.

Genitalia: Figures 186A and 186B. Very distinct in the high ridge on the ninth tergite. The style is shaped as in *H. (H.) emorsa* (fig. 185).

Female: Similar to the male except for the usual sexual differences.

Type: Male, reared from Chautauqua Lake, N. Y., July 29, 1937, H. K. Townes (Townes). The type is on a microscope slide with its pupal skin.

Paratypes: Female and its pupal skin on microscope slide, reared from Chautauqua Lake, N. Y., August 9, 1937, H. K. Townes (Townes); pupal skin on microscope slide, reared from Chautauqua Lake, N. Y., July 27, 1937, H. K. Townes (Townes); skin of last instar female larva on microscope slide, reared from Chautauqua Lake, N. Y., August 2, 1937, H. K. Townes (Townes); male, head of Chautauqua Lake, N. Y., July 27, 1937, H. K. Townes and G. E. Burdick (Townes); 7 males, 5 females, Costello Lake in Algonquin Park, Ontario, June 23, 1937, June 26, 1937, August 14, 1937, August 16, 1937, and August 17, 1937, R. B. Miller (Miller, Townes). I have also seen pupae of this species from the Hudson River in the vicinity of Poughkeepsie, N. Y.

187. *Harnischia* (*Harnischia*) *fastigata*, new species

Male: Wing 2.6 mm. long; leg ratio 1.65; antennal ratio 2.3; fore tarsus without a beard.

Abdomen pale green; head and thorax ochraceous. Pedicel pale orange; palpus and flagellum beyond its base brown; legs pale ochraceous green; front tibia and tarsus and apex of front femur brown; middle and hind legs brownish toward the apex; genitalia light brown.

Genitalia: Figure 187. Rather similar to those of *H. (H.) cuneata* (fig. 188) but the style longer and the cuneate base of the anal point shorter.

Female: Unknown.

Type: Male, Ithaca, N. Y., June 8, 1937, B. L. Krafchick (Townes).

Paratypes: Male, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes); male, Osceola County, Mich., June 4, 1940, R. R. Dreisbach (USNM); male, Ithaca, N. Y., June (Cornell); male, Ithaca, N. Y., June 7, 1937, J. G. Rempel (Rempel); male, Norway Bay, Quebec, August 25, 1938, G. E. Shewell (CNC).

188. *Harnischia (Harnischia) cuneata*, new species

Male: Wing 3.2 mm. long; leg ratio 1.75; antennal ratio 3.25; fore tarsus without a beard.

Abdomen pale green; head and thorax ochraceous. Pedicel ochraceous to brown; palpus and flagellum beyond its base brown; legs pale ochraceous green; front tibia and tarsus and apex of front femur brown; middle and hind legs brownish toward the apex; genitalia light brown.

Genitalia: Figure 188. Similar to those of *H. (H.) fastigata* (fig. 187) but the cuneate base of the anal point is longer and the style shorter.

Female: Unknown.

Type: Male, bank of Delaware River at Riverton, N. J., at the mouth of a creek, June 5, 1939, H. K. Townes (Townes).

Paratypes: Nineteen males (including 2 collected with the type) from the District of Columbia (Washington); Illinois (Chicago); Indiana (Mineral Springs); Iowa (Davenport); Michigan (Isle Royale and Midland County); New Jersey (Riverton); New York (Buffalo, Canajoharie, Germantown, and Ithaca); Ontario (Norway Point on Lake of Bays, Ottawa, and Point Pelee); and Quebec (Aylmer). Paratypes are in the collections of Townes, Canadian National Collection, Harvard, United States National Museum, Hauber, Dreisbach, Sabrosky, Rempel, and California Academy. Adults occur throughout the growing season. Collection dates are from May 17 in Midland County, Mich., to September 13 at Riverton, N. J.

189. *Harnischia (Harnischia) nigrovittata* (Malloch),
new combination

Chironomus nigrovittatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:456; type locality: St. Joseph, Ill. (Ill.).

Male: Wing 1.5 mm. long; leg ratio 1.35; antennal ratio 2.2; fore tarsus without a beard.

Dark pea green. Sclerites of thorax blackish brown; pedicel blackish brown; flagellum and mouthparts greenish brown; legs stramineous; front tibia and tarsus and apex of front femur brown, the basitarsus somewhat paler except at its apex; middle and hind tarsi brown toward the apex; abdomen more or less fuscous above, especially toward the base and apex; genitalia brown, the style whitish.

Genitalia: Figure 189. The shape of the style is distinctive. Apparently

Malloch mistook the bristle-bearing tubercle on each side of the anal point as a separate appendage.

Female: Malloch describes this sex as "similar to the male except for the usual sexual characters and in having the abdominal segments with narrow pale posterior margins."

This species is near and perhaps the same as the European *tener* Kieffer, 1918.

Material: Two males, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes); male, Davenport, Iowa, May 7, 1942, U. A. Hauber (Hauber); male, Lake Amana, Iowa, June 23, 1928, G. O. Henderson (CNC); male, Rome, N. Y., June 28, 1934, H. K. Townes (Townes). The male from South Haven, Mich., mentioned by Malloch, is a specimen of *H. (H.) pseudotener*.

190. *Harnischia* (*Harnischia*) *pseudotener* (Goetghebuer),
new combination

Chironomus pseudotener Goetghebuer, 1922, Ann. Biol. Lacustre 11:38 type locality: Virton, Belgium (location of type unknown).

Male: Wing 2.2 mm. long; leg ratio 1.9; antennal ratio 2.3; fore tarsus without a beard.

Abdomen pea green, the rest of the insect ochraceous. Flagellum except base light brown; legs stramineous; fore tibia, apex of fore femur, and apical segments of middle and hind tarsi brown; fore tarsus brown.

Genitalia: Figure 190. The shape of the style and that of the superior appendage are distinctive.

Female: Similar to the male except for the usual sexual differences.

I have studied a series of 1 male and 3 females from England in the United States National Museum, determined by Edwards.

Material: Male, District of Columbia, May 10, Patton (USNM); male, Midland County, Mich., July 21, 1941, R. R. Dreisbach (Dreisbach); male, South Haven, Mich., July 15, 1914 (Ill.); 4 males, Ithaca, N. Y., June 3, 1940, June 5, 1940, June 6, 1935, and September 12, 1938, H. and M. Townes (Townes); male, Ithaca, N. Y., May 30, 1937, J. G. Rempel (Rempel); and 2 males, Philadelphia, Pa., May 11, 1941, H. and M. Townes (Townes). The species occurs also in England, Belgium, and Holland.

191. *Harnischia* (*Harnischia*) *argentea*, new species

Male: Wing 4.5 mm. long; leg ratio 1.35; antennal ratio 3.9; fore tarsus with a short indistinct beard; mesoscutum with a tuberculate hump at the center; bristles between the median and lateral lobes of mesoscutum arranged in about a quadruple row. This is the largest and most robust species of the genus known to me, and the only one in which the mesoscutal hair rows are not single or partially double.

Light olive green and strongly pruinose. Thoracic sclerites mostly brown; flagellum except at the base brown; basal 0.7 of antennal bristles brown, the

apical 0.3 silver; bristles on apical 0.25 of flagellum entirely silver; legs stramineous; basal and apical 0.2 of fore tibia and apical 0.2 of fore femur brown; apex of tarsal segments 1 to 4 and all of apical segments brown.

Genitalia: Figure 191, drawn from the type. Rather similar to those of *H. (H.) grisea* (fig. 192) but differing in the shape of the superior appendage.

Female: Unknown.

Type: Male, Fitzroy Harbor, Ontario, July 11, 1938, G. E. Shewell (CNC).

Paratype: Male, Riverton, N. J., August 21, 1898, C. W. Johnson (Harvard).

192. *Harnischia (Harnischia) grisea* (Malloch),
new combination

Chironomus griseus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:468; Type locality: Shore of Lake Michigan at South Haven, Mich. (Ill.).

Male: Wing 2.6 mm. long; leg ratio 1.4; antennal ratio 2.9; fore tarsus with a short indistinct beard; mesoscutum often with a prominent hump at center.

Yellowish brown to light olive green with a strong whitish to pale gray pruinosity, often almost entirely dark brown. Pedicel and thoracic sclerites except scutellum reddish to blackish brown; flagellum, clypeus, and mouthparts light to dark brown; bristles of flagellum whitish on apical 0.25 of flagellum and above, bristles elsewhere brown with the apical part pale, darkest between the apical 0.5 and 0.75; legs whitish to pale brown, the apices of femora, tibiae, and tarsal segments brown and the apical one to three tarsal segments entirely brown; basal 0.3 of fore tibia brownish; abdomen olive green to dark brown, the posterior parts of the tergites more pruinose, giving the abdomen a banded appearance; apical part of style darker than the rest.

Genitalia: Figure 192. Rather similar to those of *H. (H.) argentea* (fig. 191) but the superior appendage is of a more lanceolate shape.

Female: Unknown.

Material: Two males, Burlington, Ill., June 25, 1940, H and M. Townes (Townes); male, Midland County, Mich., June 27, 1941, R. R. Dreisbach (Dreisbach); 3 males, Great Falls, Mont., July 6 and 7, 1921, H. G. Dyar (USNM, Townes); male, Ada, Okla., July 16, 1937, Standish and Kaiser (Townes); male, Oswalt, Okla., July 5, 1937, Standish and Kaiser (Okla.); 2 males, Brownsville, Tex., May 1 and 4, 1904, H. S. Barber (USNM); and male, no data (Mass.).

193. *Harnischia (Harnischia) alboriviridis* (Malloch),
new combination

Chironomus alboriviridis Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10: 482; type locality: Urbana, Ill. (Ill.).

Male: Wing 2.1 mm. long; leg ratio 2.0; antennal ratio 2.8; fore tarsus without a beard; mesoscutum with a prominent hump at the center.

Pale yellowish green with a very strong whitish pruinosity. Pedicel and thoracic sclerites except scutellum light reddish brown; flagellum beyond the base brown; flagellar bristles above and on the apical 0.25 whitish, elsewhere brown with a white apex, darkest between the apical 0.5 and 0.75; mouthparts pale brown; legs whitish; apices of tibiae and of basal three segments of tarsi brown; last two segments of tarsi brown; front tibia obscurely marked with brown near the middle; apical 0.2 of fore femur light brown; middle and hind femora with a subapical spot or annulus and their tibiae with a subbasal and median spot or annulus light brown or green; coxae tinged with reddish brown; abdominal tergites tinged centrally with brown, darker toward the apical segments; genitalia mostly brown.

Genitalia: Figure 193. Similar to those of *H. (H.) grisea* (fig. 192) and *H. (H.) argentea* (fig. 191), but at once distinguished from these and superficially similar to those of *H. (H.) spectabilis* (fig. 197) in the produced lateral apical corners of the ninth tergite.

Female: Similar to the male except for the usual sexual differences.

Material: Male, Davenport, Iowa, July 7, 1941, U. A. Hauber (Hauber); 8 males, Gore, Okla., August 8, 1940, H. and M. Townes (Townes).

194. *Harnischia (Harnischia) incidata*, new species

Male: Wing 2.0 mm. long; leg ratio 1.75; antennal ratio 2.2; fore tarsus without a beard.

Light green. Pedicel, flagellum beyond its base, and mouthparts brown; thorax mostly ochraceous; legs pale stramineous, brown toward the apex; seventh and following segments tinged with pale brown.

Genitalia: Figure 194, drawn from the type. Rather similar to those of *H. (H.) curtilamellata* (fig. 195) in most respects but differing in details of the anal point and superior aependage and distinctly in the strong constriction between the style and coxite.

Female: Unknown.

Type: Male, Overhoser Lake, Oklahoma City, Okla., August 27, 1940, H. K. Townes (Townes).

Paratypes: Three males, taken with the type (Townes).

195. *Harnischia (Harnischia) curtilamellata*, (Malloch), new combination

Chironomus curtilamellatus Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:474; type locality: South Haven, Mich. (Ill.).

Chironomus (Chironomus) curtilamellatus (Harnischia group) Miller, 1941, Univ. Toronto Studies (biol. ser.) 49: 20, 61, 62; biology.

Male: Wing 2.3 mm. long; leg ratio 2.2; antennal ratio 2.6; fore tarsus without a beard.

Abdomen pale green, head and thorax ochraceous. Flagellum and palpus

pale brown; legs stramineous, brown toward the apices of the tarsi; fore tibia darker than the others; apical part of abdomen brownish green.

Genitalia: Figure 195. The very small weak superior appendage, heavy and broadly fused style and coxite, and the broad anal point are unusual. *H. (H.) incidata* (fig. 194) is similar to this species in most respects but differs in the sharp notch between the style and coxite.

Female: Unknown.

This may be the same species as *pseudosimplex* Goetghebuer, 1923, of Europe.

Material: Male, Burlington, Ill., June 25, 1940, H. and M. Townes (Townes); 3 males, Buffalo, N. Y., October 13 and 15, 1910, M. C. Van Duzee (Calif. Acad.); 4 males, Canajoharie, N. Y., July 15 and 16, 1934, H. K. Townes (Townes and Rempel); 4 males, Shokan, N. Y., July 8, 1936, H. K. Townes (Townes); male, Costello Lake in Algonquin Park, Ontario, July 13, 1937, R. B. Miller (Miller); male, Brownsville, Tex., May 1, 1904, H. S. Barber (USNM); male, Falls Church, Va., May 7, N. Banks (Harvard).

196. *Harnischia (Harnischia) edwardsi* (Kruseman),
new combination

Chironomus (Chironomus) virescens (*Cryptochironomus* and *Harnischia* groups) Edwards, 1929, Trans. Ent. Soc. London 77:391; misdetermination of *virescens* Meigen.

Tendipes (Parachironomus) edwardsi Kruseman, 1933, Tijdschr. Ent. 76:194; type locality: Valkenswaard, Netherlands (new name for *virescens* of Edwards).

Chironomus (Chironomus) edwardsi (*Harnischia* group) Miller, 1941, Univ. Toronto Studies (biol. ser.) 49:20; generic position.

Male: Wing 1.9 mm. long; leg ratio 1.7; antennal ratio 2.3; fore tarsus without a beard.

Pea green. Thorax marked with ochraceous; pedicel brown; flagellum except base and palpus brown; legs pale green; front tibia and tarsus and apex of front femur brown; middle and hind legs brown toward the apex; seventh and following abdominal segments tinged with brown.

Genitalia: Figure 196. The prominent lateral corners on the ninth tergite with bristles on them are distinctive.

Female: Unknown.

I have compared Nearctic material with a male from England determined as *virescens* by Edwards.

Material: Male, Riverton, N. J., May 5, 1939, H. K. Townes (Townes); 2 males, Eagle Bridge, N. Y., September 6, 1934, H. K. Townes (Townes); 3 males, Ithaca, N. Y., June 5, 1940, H. and M. Townes (Townes); male, Ithaca, N. Y., July 1, 1937, J. G. Rempel (Rempel); male, Ithaca, N. Y., September (Cornell); 10 males, Ithaca, N. Y. (Cornell); male, Syracuse, N. Y., May 8, 1938, H. and M. Townes (Townes); and 4 males, Costello Lake in Algonquin Park, Ontario, July 2, 4, 6, and 7, 1937, R. B. Miller (Miller and Townes). In Europe, the species is known from England and Holland.

197. *Harnischia (Harnischia) spectabilis*, new species

Male: Wing 1.9 mm. long; leg ratio 1.6; antennal ratio 2.4; fore tarsus without a beard.

Pea green. Thorax marked with ochraceous; pedicel brown; flagellum except base and palpus brown; legs pale green; front tibia and apex of front femur brown; middle and hind legs brown towards the apex; seventh and following abdominal segments tinged with brown.

Genitalia: Figure 197, drawn from the type. The produced lateral corners of the ninth tergite give this species a superficial similarity in this character to *H. (H.) albobiviridis* (fig. 193), from which it is abundantly distinct in general appearance and in details of genitalia.

Female: Unknown.

Type: Male, Costello Lake in Algonquin Park, Ontario, June 21, 1937, R. B. Miller (Townes).

198. *Harnischia (Harnischia) amachaerus*, new species

Male: Wing 1.9 mm. long; leg ratio 1.6; antennal ratio 2.5; fore tarsus without a beard.

Pea green. Thorax marked with ochraceous or brown; pedicel brown; flagellum except base and palpus brown; legs pale green; front tibia and tarsus and apex of front femur brown; middle and hind legs brown toward the apex; seventh and following abdominal segments tinged with brown.

Genitalia: Figure 198. Similar to those of *H. (H.) viridulus* (fig. 199), but the anal point is narrower and the ninth tergite is without a longitudinal carina.

Female: Unknown.

Type: Male, bank of Hudson River at Germantown, N. Y., June 22, 1936, H. K. Townes (Townes).

Paratypes: Male, Chicago, Ill., May 13, 1899 (Cornell); male, Cass Lake, Minn., July 24, 1936, R. H. Daggy (Minn.); male, Westville, N. J., August 12, 1893, C. W. Johnson (Harvard).

199. *HARNISCHIA (HARNISCHIA) VIRIDULUS* (Linnaeus)

Tipula viridulus Linnaeus, 1767, Syst. Nat., Ed. 12:975; type locality: Sweden (type probably destroyed).

Chironomus (Harnischia) viridulus Goetghebuer, 1928, Faune de France 18:86; generic position.

Male: Wing 2.0 mm. long; leg ratio 1.7; antennal ratio 2.3; fore tarsus without a beard.

Pea green. Thorax marked with ochraceous to light brown; pedicel brown; flagellum except base and palpus brown; legs pale green; front tibia and tarsus

and apex of front femur brown; middle and hind legs brown toward the apex; seventh and following abdominal segments tinged with brown.

Genitalia: Figure 199. Similar to those of *H. (H.) amachaerus* (fig. 198) but the anal point broader and the ninth tergite and basal part of anal point with a high thin carina.

Female: Similar to the male except for the usual sexual differences.

Linnaeus' name is applied to the present species through usage rather than from an ability to recognize the species from its description. Some authors use the name *viridulus* Fabricius because Linnaeus' *viridulus* was described as being the size of a flea (somewhat smaller than this species), while Fabricius' misdetermination of *viridulus* Linnaeus is probably or possibly this species. I prefer to apply Linnaeus' name here as there seems to be no proof that such a course would involve serious error. To use the name *viridulus* and attribute it to Fabricius seems hardly in agreement with nomenclatorial principles. I have compared Nearctic material with a series of six males from England, determined by Edwards. These differ from my American material in having the thoracic markings brown.

Material: Many males from Illinois (Burlington); Iowa (Crystal Lake at Davenport); Maryland (Plummers Island); Massachusetts (South Hadley); Michigan (Mackinac and Midland County); New Jersey (Westville); New York (Canajoharie, Ithaca, and Newport); and Ohio (Summit County). Adults occur throughout the growing season. They have been collected from May 5 at Crystal Lake, Davenport, Iowa, and May 14 at South Hadley, Mass., to September 18 at Ithaca, N. Y. The species is common and widespread in Europe.

200. *Harnischia* (*Harnischia*) *collator*, new species

Chironomus (*Microchironomus*) sp. 2. Townes, 1938, Ann. Rpt. N. Y. State Conservation Dept. 27, suppl.: 172; biology, description of pupa.

Male: Wing 1.9 mm. long; leg ratio 1.8; antennal ratio 2.2; fore tarsus without a beard.

Abdomen pale green, head and thorax ochraceous. Flagellum and palpus pale brown; legs stramineous; fore tibia and apex of fore femur pale brown; tarsi brown toward the apex, the fore tarsus much darker; seventh and following abdominal segments tinged with brown.

Genitalia: Figure 200. The unusually long curved style, narrowed at the base, and the shoulder on the ninth tergite on each side of the anal point, are distinctive.

Female: Similar to the male except for the usual sexual differences.

Type: Male on microscope slide with its larval and pupal skins, reared from Chautauqua Lake, N. Y., August 26, 1937, H. K. Townes (Townes).

Paratypes: Male, Carlton, Minn., June 10, 1934, D. G. Denning (Minn.); female on microscope slide with its larval and pupal skins, reared from Chautauqua Lake, N. Y., August 25, 1937, H. K. Townes (Townes); 2 males,

Summit County, Ohio, August 18, 1937, Louis J. Lipovsky (Kans., Townes); male, Summit County, Ohio, July 22, 1934, Louis J. Lipovsky (Kans.).

201. *Harnischia* (*Harnischia*) *galeator*, new species

Male: Wing 1.7 mm. long; leg ratio 1.65; antennal ratio 2.5; fore tarsus without a beard.

Pale green. Thorax marked with ochraceous; pedicel brown; flagellum except base and palpus brown; legs pale green; front tibia and tarsus and apex of front femur brown; middle and hind legs brown toward the apex.

Genitalia: Figure 201, drawn from the type. The hood-like swelling over the base of the anal point is distinctive.

Female: Unknown.

Type: Male, Canoe Creek, 12 miles south of St. Cloud on Vermont Avenue, Osceola, Fla., April 4, 1940, S. M. Brown, Jr. (Townes).

Paratype: Male, Davenport, Iowa, April 11, 1942, U. A. Hauber (Hauber).

Unrecognizable Species and Species Erroneously
Described as Tendipedini

For the names listed below, an examination of the types in the light of the characters pointed out in this revision is necessary before the names can be applied with certainty. The probable application of the names has been pointed out when it seems profitable to do so, but this guessing is done only for its zoological interest and is not to be construed as establishing new synonymy or new generic placements. Professor O. A. Johannsen has examined most of the types in European museums and has generously supplied me with copies of his notes. Some of these notes have already been published by Johannsen. Others are given below in the hope that they will be useful to future students.

CHIRONOMUS ALBISTRIA Walker, 1848, List Dipterous Ins. British Mus. 1:17; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

Chironomus albistria Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:275; notes on the type.

I am not able to identify this species.

CALOPSECTRA AMERICANA Kieffer, 1917, Ann. Mus. Nat. Hung. 15:357; type locality: Long Lake, Adirondack Mountains, N. Y. (Budapest museum).

This is doubtless a member of the subgenus *Pentapedilum*. Professor Johannsen has examined the type (♀) and in his manuscript notes states that it is the same as *Pentapedilum fulvescens* Joh.

CHIRONOMUS ANTICUS Walker, 1848, List Dipterous Ins. British Mus. 1:21; type locality: Georgia (British Museum).

Metriocnemus anticus Kieffer, 1906, Genera Ins. 42:31; generic position.

Professor O. A. Johannsen has given me the following manuscript notes on the type (♀): "Legs whitish; fore and hind femora with a brown ring beyond the middle; knees brown; tips of tibiae and extreme tips of tarsal segments brown; vein R_{2+3} absent." Both Mr. Edwards at the British Museum and Professor Johannsen agreed that the type represented a species of *Microtendipes*. It is either an off-color or stained specimen or is none of the species of *Microtendipes* known to me.

CHIRONOMUS ATTENUATUS Walker, 1848, List Dipterous Ins. British Mus. 1:20; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

Metriocnemus attenuatus Kieffer, 1906, Genera Ins. 42:31; generic position.

Chironomus attenuatus Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:275; notes on the type.

The specimen reported on as "type" in 1926 by Johannsen did not fit Walker's description well. On his visit to the British Museum in 1939, Professor Johannsen found a different specimen (♀) labeled type of this species. This specimen fitted the description better. Professor Johannsen's manuscript notes describe it as a dark-colored member of the "*C. decorus* group."

CHIRONOMUS BIMACULA Walker, 1848, List Dipterous Ins. British Mus. 1:15; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

I know this species only from the original description. It may not belong to the *Tendipedini*.

CHIRONOMUS BOREALIS Curtis, 1835, in Ross: Appendix to the Narrative of a Second Voyage in Search of a North-West Passage 1829-33, p. LXXVII; type locality: Arctic America (location of type unknown).

Curtis' description is of a species of the general appearance of *Tendipes hyperboreus*, but a number of other Arctic species of *Tendipedini* fit the description as well.

CHIRONOMUS BRUNNEUS Walker, 1848, List Dipterous Ins. British Mus. 1:21; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

Metricnemus brunneus Kieffer, 1906, Genera Ins. 42:31; generic position.

According to Professor Johannsen's manuscript notes on the type, this belongs to the Calopsectrini.

CHIRONOMUS CONFINIS Walker, 1848, List Dipterous Ins. British Mus. 1:15; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Mus.); name pre-occupied by Meigen 1830.

Chironomus connexus Kieffer, 1906, Genera Ins. 42:17; new name for *C. confinis* Walker.

This species is known to me only from the original description. It may not belong to the Tendipedini.

CHIRONOMUS CRASSICOLLIS Walker, 1848, List Dipterous Ins. British Mus. 1:18; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Mus.).

I have no information about this species other than the original description. It may not belong to the Tendipedini.

Chironomus cristatus Fabricius, 1805, Syst. Antliatorum, p. 39; type locality: New York (Copenhagen museum).

Chironomus cristatus Wiedemann, 1821, Diptera Exotica 1:11; redescription of type.

Chironomus cristatus Wiedemann, 1828, Aussereuropäische zweiflügelige Ins. 1:14; redescription of type.

Chironomus (Chironomus) cristatus Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:47; description of larva and pupa (misdetermined?).

Professor Johannsen has given me the following manuscript notes on the type: "Length 8 mm. In coloring resembling *maturus* Johannsen. Fore basitarsus detached but hanging to the anterior of the specimen, very sparsely bearded." These notes together with the published descriptions, agree well with *Tendipes staegeri*.

CHIRONOMUS DEVIATUS Malloch, 1933, North Amer. Fauna 46:172; type locality: St. Paul Island, Alaska (USNM).

I have examined the type and found that it belongs to the tribe Calopsectrini.

CHIRONOMUS EXCAVATUS Kieffer, 1917, Ann. Mus. Nat. Hung. 15:348; type locality: Long Lake, Adirondack Mountains, N. Y. (Budapest museum).

Professor Johannsen's manuscript notes on the type are as follows: "Fulvous species; abdomen a little darker than the thorax; thorax with indistinct vittae; frontal cones absent; pronotum distinct, normal; length 5 to 6 mm.; crossvein r-m pale." This may be *Cryptochironomus fulvus*.

CHIRONOMUS EXCISUS Kieffer, 1917, Ann. Mus. Nat. Hung. 15:346; type locality: Philadelphia, Pa. (Budapest museum).

According to the original description, this is either *Tendipes decorus*, *T. riparius*, or *T. stigmaterus*. Professor Johannsen saw the type in 1935 and tells me that the abdomen of the type is glued on the head so that the pronotum is not visible.

CHIRONOMUS FIMBRIATUS Walker, 1848, List Dipterous Ins. British Mus. 1:20; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

The original description seems to indicate that this species belongs to the Calopsectrini.

CHIRONOMUS FLAVICINGULA Walker, 1848, List Dipterous Ins. British Mus. 1:20; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

Chironomus flavicingula Johannsen, 1905, Bull. N. Y. State Mus. 86:208; description of larva, pupa, and adult (misdetermined?).

Chironomus flavicingula Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:432; description of larva, pupa, and adult (misdetermined?).

Chironomus flavicingula Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:276; notes on type.

Chironomus (Stictochironomus) flavicingula Johannsen, 1938, Mem. Cornell Univ. Agr. Exp. Sta. 210:29; description of larva and pupa (misdetermined?).

This is a typical member of the subgenus *Stictochironomus*. It is similar to a number of closely related species, and the type would have to be examined carefully to make certain of its identity.

CHIRONOMUS HALOPHILUS Packard, 1873, in Baird: Report on the condition of the sea fisheries of the south coast of New England in 1871 and 1872, p. 539; type localities: Vineyard Sound several miles from land, dredged from 10 fathoms; and Woods Hole Passage, dredged from 8 to 10 fathoms (location of type unknown).

Packard gave only a general description of the larva, which was evidently a typical member of the subgenus *Tendipes*, and probably is that of *T. decorus*. I have reared *T. decorus* from a strongly brackish pond on Long Island, N. Y.

CHIRONOMUS HARTI Malloch, 1915, Bull. Ill. State Lab. Nat. Hist. 10:457; type locality: Urbana, Ill. (Ill.).

I have seen the type (♀) but was not able to study it as carefully as I should wish. It seems to belong to *Apedilum* and may be an abnormally colored specimen of *Apedilum nigrohalterale* or of *A. elachistus*.

CHIRONOMUS LASIOPUS Walker, 1848, List Dipterous Ins. British Mus. 1:19; type locality: St. Martin's Falls, Albany River, Hudson Bay (type lost).

According to the original description, this is probably either *Tendipes decorus* or *T. riparius*. Professor Johannsen was not able to find the type in the British Museum.

CHIRONOMUS MELANDERI Kieffer, 1917, Ann. Mus. Nat. Hung. 15:347; type locality: Pullman, Wash. (Budapest museum).

According to the original description and to Professor Johannsen's manuscript notes on the type, this is probably *Tendipes decorus*, but may be *T. riparius*.

CHIRONOMUS NIGRITIBIA Walker, 1848, List Dipterous Ins. British Mus. 1:16; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

According to the original description and to Professor Johannsen's manuscript notes on the type, this is either *Glyptotendipes brachialis* or the very similar and perhaps synonymous *G. atrimanus*. The color of the fore tarsus is not mentioned specifically in the original description and the fore tarsi of the type were lacking when Professor Johannsen examined it (perhaps they were lacking when Walker wrote his description), so it is at present not possible to say to which of the above two species the type belongs.

CHIRONOMUS PELLUCIDUS Walker, 1848, List Dipterous Ins. British Mus. 1:21; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

Tanytarsus pellucidus Johannsen, 1926, Jour. N. Y. Ent. Soc. 34:275; notes on the type.

Johannsen has referred this to the *Calopsectrini*.

CHIRONOMUS POLARIS Kirby, 1821, Suppl. Append. Parry's First Voyage for the Discovery of a North-West Passage 1819-20, p. CCXVIII; type locality: America, within the Arctic Circle (location of type unknown).

The original description is of a species of the general appearance of *Tendipes hyperboreus*, but a number of other Arctic species of Tendipedini also will fit the description. Professor Johannsen found a specimen labeled *Chironomus polaris* in the

British Museum, but he concluded that it was not the type. Only the thorax and a wing of this specimen remains.

CHIRONOMUS REDEUNS Walker, 1856, *Insecta Saundersiana* 1:422; type locality: United States (British Museum).

Professor Johannsen has given me the following manuscript notes on the type (♀): "Cu₁ slightly upturned at the apex and ends distad of the tip of R₂₊₃; crossvein r-m dark; veins darker than in *C. attenuatus*; thorax colored as in *C. cristatus*; legs and abdomen of type missing." This is probably the same as either *Tendipes decorus* or *T. riparius*.

CHIRONOMUS TRICHOMERUS Walker, 1848, *List Dipterous Ins. British Museum* 1:21; type locality: St. Martin's Falls, Albany River, Hudson Bay (British Museum).

Metriocnemus trichomerus Kieffer, 1906, *Gen. Ins.* 42:32; generic placement.

Tanytarsus trichomerus Johannsen, 1926, *Jour. N. Y. Ent. Soc.* 34:275; notes on the type.

Johannsen has referred this species to the Calopsectrini.

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112. <i>blarina</i> , new species	99	142. <i>biseta</i> , new species	127
113. <i>digitatus</i> (Malloch)	100	143. <i>utahensis</i> (Malloch)	127
(<i>stylifera</i> var. a Johannsen)	100	144. <i>tuberculatus</i> , new species	128
114. <i>psittacinus</i> (Meigen)	100	145. <i>pilicornis</i> (Fabricius)	128
(<i>stylifera</i> Johannsen)	101	(<i>conformis</i> Malloch)	129
(<i>obtusilobus</i> Malloch)	101	146. <i>staegeri</i> (Lundbeck)	129
(<i>farinalis</i> Walley)	101	(<i>fasciventris</i> Malloch)	129

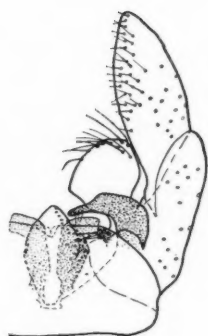
147. <i>anthracinus</i> (Zetterstedt)	130	168. <i>undine</i> , new species	149
("hyperboreus" American		169. <i>nereis</i> , new species	150
authors)	130	170. <i>tylus</i> , new species	150
(<i>meridionalis</i> Johannsen)	130	171. <i>doris</i> , new species	151
148. <i>atritibia</i> (Malloch)	131	172. <i>amphitrite</i> , new species	151
149. <i>plumosus</i> (Linnaeus)	132	173. <i>orbicus</i> , new species	151
(<i>ferrugineovittatus</i>		174. <i>tethys</i> , new species	152
Zetterstedt)	132	(<i>Harnischia</i>)	152
(<i>imperator</i> Walley)	132	175. <i>frequens</i> (Johannsen)	155
150. <i>crassicaudatus</i> (Malloch)	134	(<i>longiforceps</i> Kieffer)	155
151. <i>tentans</i> (Fabricius)	135	176. <i>abortiva</i> (Malloch)	156
(<i>pallidivittatus</i> Malloch)	135	177. <i>clodeae</i> , new species	156
<i>Glyptotendipes</i>	136	178. <i>forceps</i> , new species	157
(<i>Demeijerea</i>)	136	179. <i>vara</i> (Goetghebuer)	157
152. <i>brachialis</i> (Coquillett)	137	180. <i>claviger</i> , new species	158
153. <i>atrimanus</i> (Coquillett)	138	181. <i>carinata</i> , new species	158
154. <i>abruptus</i> , new species	138	182. <i>potamogeli</i> , new species	159
155. <i>obreptus</i> , new species	139	183. <i>monochromus</i> (Wulp)	160
(<i>Phylotendipes</i>)	139	184. <i>tenuicaudata</i> (Malloch)	160
156. <i>testaceus</i> , new species	140	(<i>modestus</i> var.	
157. <i>barbipes</i> (Staeger)	140	a Johannsen)	160
158. <i>paripes</i> (Edwards)	141	(<i>basiliger</i> Kieffer)	160
159. <i>lobiferus</i> (Say)	142	185. <i>emorsa</i> , new species	161
(<i>lobifer</i> Wiedemann)	142	186. <i>casuaria</i> , new species	162
(<i>caliginosus</i> Johannsen)	142	187. <i>fastigata</i> , new species	162
(<i>ithacanensis</i> Johannsen)	142	188. <i>cuneata</i> , new species	163
(<i>gripekoveni</i> Kieffer)	142	189. <i>nigrovittata</i> (Malloch)	163
(? <i>americanus</i> Kieffer)	142	190. <i>pseudotener</i> (Goetghebuer)	164
(<i>Glyptotendipes</i>)	144	191. <i>argentea</i> , new species	164
160. <i>senilis</i> (Johannsen)	144	192. <i>grisea</i> (Malloch)	165
161. <i>amplus</i> , new species	145	193. <i>alboviridis</i> (Malloch)	165
162. <i>dreisbachi</i> , new species	145	194. <i>incidata</i> , new species	166
163. <i>seminole</i> , new species	146	195. <i>curtilamellata</i> (Malloch)	166
164. <i>unacus</i> , new species	146	196. <i>edwardsi</i> (Kruseman)	167
<i>Harnischia</i>	147	197. <i>spectabilis</i> , new species	168
(<i>Cladopelma</i>)	147	198. <i>amachaerus</i> , new species	168
165. <i>galaptera</i> , new name	148	199. <i>viridulus</i> (Linnaeus)	168
(<i>claripennis</i> Malloch)	148	200. <i>collator</i> , new species	169
166. <i>nixe</i> , new species	149	201. <i>galeator</i> , new species	170
167. <i>nais</i> , new species	149		

Explanation of Plates

The figures of wings and of genitalia were all done with the aid of a microscopic projection machine. With the exception of three species of the subgenus *Tendipes*, all genitalia of a single genus or subgenus are to the same scale. Six scales of magnification were used. Beginning with the greatest magnification, these are: 1, Figs. 24-26 (*Apedilum*); 2, figs. 11-13, 17-23, 27-29, and 165-201 (*Lauterborniella*, *Omisus*, *Paratendipes*, *Kribioxenus*, and *Harnischia*); 3, figs. 30-67, 104-108, 115-124, and 126-129 (*Polypedilum*, *Xenochironomus*, and *Tendipes* [subgenera *Limnochironomus* and *Einfeldia*]); 4, figs. 1-10, 14-16, 69-103, and 109-114 (*Pseudochironomus*, *Microtendipes*, *Tanytarsus*, *Stenochironomus*, and *Cryptochironomus*); 5, figs. 125A-125B, 130-148, and 152-164 (*Tendipes* [subgenera *Kiefferulus*, *Chaetolabis*, and *Tendipes* in part] and *Glyptotendipes*); and 6, figs. 149-151 (*Tendipes plumosus*, *T. crassicaudatus*, and *T. tentans*).

Figs. 227 through 261, with the exception of figure 242, are all from male specimens.

Male genitalia, dorsal view	Figures	<i>Glyptotendipes brachialis</i>	233
		<i>Glyptotendipes lobiferus</i>	234
<i>Pseudochironomus</i>	1-10	Dorsal view of anterior end of pronotum, showing shape of pronotum	
<i>Lauterborniella</i>	11-13		
<i>Microtendipes</i>	14-16		
<i>Omisus</i>	17	<i>Pseudochironomus netta</i>	235
<i>Paratendipes</i>	18-23	<i>Tanytarsus sublendens</i>	236
<i>Apedilum</i>	24-26	<i>Xenochironomus scopula</i>	237
<i>Kribioxenus</i>	27-29	<i>Cryptochironomus digitalis</i>	238
<i>Polypedilum</i> (<i>Tripodura</i>)	30-44	<i>Tendipes plumosus</i>	239
<i>Polypedilum</i> (<i>Polypedilum</i>)	45-64	<i>Glyptotendipes brachialis</i>	240
<i>Polypedilum</i> (<i>Pentapedilum</i>)	65-67	<i>Glyptotendipes lobiferus</i>	241
<i>Tanytarsus</i> (<i>Endochironomus</i>)	69	Ventral view of last tarsal segment, showing pulvilli	
<i>Tanytarsus</i> (<i>Tribelos</i>)	70-74B		
<i>Tanytarsus</i> (<i>Tanytarsus</i>)	75-82	<i>Paratendipes albimanus</i>	242
<i>Tanytarsus</i> (<i>Sticlochironomus</i>)	83-87	<i>Polypedilum laetum</i>	243
<i>Stenochironomus</i>	96-103	<i>Tendipes plumosus</i>	244
<i>Xenochironomus</i>	104-108	Apical part of left front tibia, showing armature	
<i>Cryptochironomus</i>	109-114		
<i>Tendipes</i> (<i>Limnochironomus</i>)	115-124	<i>Pseudochironomus richardsoni</i>	245
<i>Tendipes</i> (<i>Kiefferulus</i>)	125A-125B	<i>Paratendipes albimanus</i>	246
<i>Tendipes</i> (<i>Einfeldia</i>)	126-129	<i>Kribioxenus babyi</i>	247
<i>Tendipes</i> (<i>Chaetolabis</i>)	130-131	<i>Polypedilum laetum</i>	248
<i>Tendipes</i> (<i>Tendipes</i>)	132-151	<i>Tanytarsus jucundus</i>	249
<i>Glyptotendipes</i> (<i>Demeijerea</i>)	152-155	<i>Tendipes plumosus</i>	250
<i>Glyptotendipes</i> (<i>Phytotendipes</i>)	157-159	Apical part of left hind tibia, showing combs and spines	
<i>Glyptotendipes</i> (<i>Glyptotendipes</i>)	162-164		
<i>Harnischia</i> (<i>Cladopelma</i>)	165-174	<i>Pseudochironomus richardsoni</i>	251
<i>Harnischia</i> (<i>Harnischia</i>)	175-201	<i>Paratendipes duplicatus</i>	252
Wing, to show color pattern		<i>Apedilum subcinctum</i>	253
<i>Lauterborniella</i>	202-203	<i>Polypedilum laetum</i>	254
<i>Paratendipes</i>	204	<i>Tanytarsus jucundus</i>	255
<i>Apedilum</i>	205	<i>Tanytarsus devinctus</i>	256
<i>Polypedilum</i> (<i>Tripodura</i>)	206-212	<i>Tendipes plumosus</i>	257
<i>Polypedilum</i> (<i>Polypedilum</i>)	213-215	<i>Harnischia carinata</i>	258
<i>Tanytarsus</i> (<i>Sticlochironomus</i>)	216-217	Figures to illustrate terminology	
<i>Stenochironomus</i>	218-224	Wing of <i>Pseudochironomus richardsoni</i> , with veins labeled	259
<i>Tendipes</i> (<i>Tendipes</i>)	225	Dorsal view of head of <i>Tendipes plumosus</i> , showing frontal tubercles	260
<i>Glyptotendipes</i> (<i>Demeijerea</i>)	226	Dorsal view of male genitalia of <i>Polypedilum laetum</i> , with parts labeled	261
Side view of anterior end of thorax, showing shape of pronotum			
<i>Pseudochironomus netta</i>	227		
<i>Omisus pica</i>	228		
<i>Polypedilum artifer</i>	229		
<i>Tanytarsus sublendens</i>	230		
<i>Stenochironomus taeniapennis</i>	231		
<i>Tendipes plumosus</i>	232		



1. *CRASSUS*



2. *RICHARDSONI*



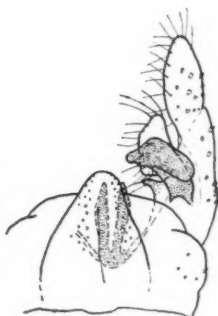
3. *FULVIVENTRIS*



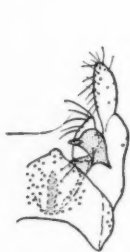
4. *PSEUDOVIRIDIS*



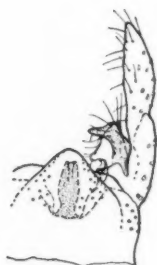
5. *ANAS*



6. *BANKSI*



7. *MIDDLEKAUFFI*



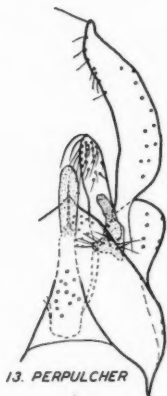
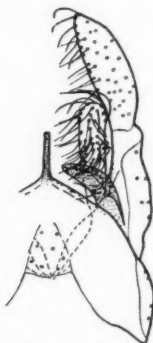
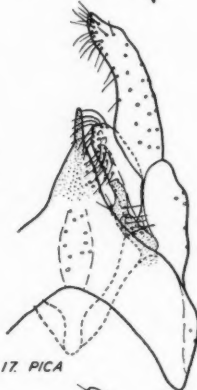
8. *CHEN*



9. *AUX*

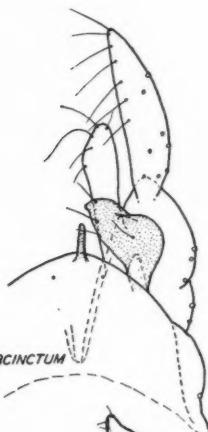


10. *NETTA*

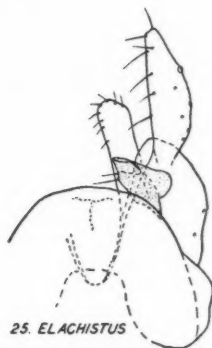
11. *AGRAVLOIDES*12. *VARIPENNIS*13. *PERPULCHER*14. *CAELUM*15. *CADUCUS*16. *PEDELLUS*17. *PICA*18. *ALBIMANUS*19. *NITIDULUS*20. *DUPLICATUS*21. *BASIDENS*22. *SUBAEQUALIS*



23. THERMOPHILUS



24. SUBCINCTUM



25. ELACHISTUS



26. NIGROHALTERALE



27. BABIYI



28. MIRABILIS



29A. BICORNIS



29B. BICORNIS



30. SCALAENUM



31. APICATUM



32. PTEROSPILUS



33. PARVUM



34. PARDUS



37. ISOCERUS



38. GOMPHUS



39. FLORIDENSE



40. SIMULANS



41. HALTERALE



42. DIGITIFER



43. GRISEOPUNCTATUM



44. ACIFER



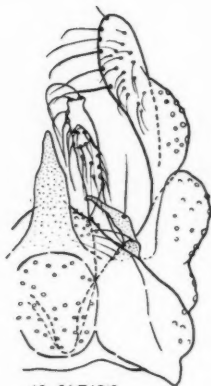
45. NUBECULOSUM



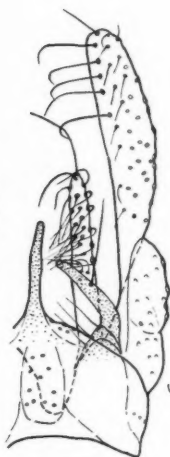
46. TRIGONUS



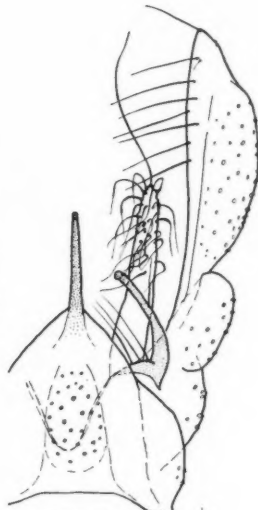
47. LAETUM



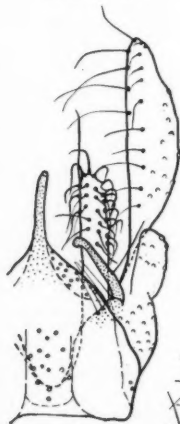
48. ONTARIO



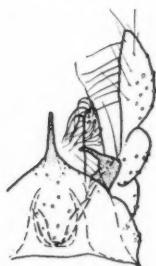
49. VIBEX



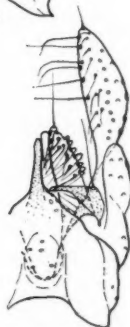
50. WALLEYI



52. FALLAX



54A. PEDATUM
PEDATUM



54B. PEDATUM
EXCELCIUS



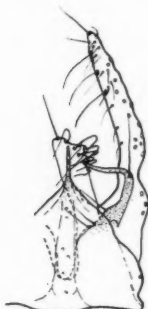
55. NIGRITUM



56. ANGUSTUM



57. ILLINOENSE



58. OPHIOIDES



59. BRASENIAE



60. SULACEPS



61. CINCTUM



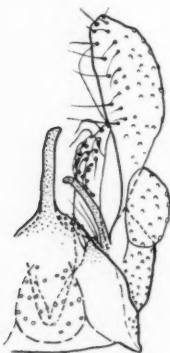
62. CONVICTUM



63. OBTUSUM



64. AVICEPS



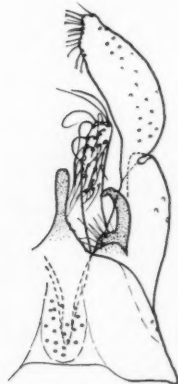
65. SORDENS



66. TRITUM



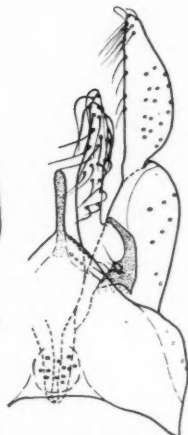
67. ALBULUM



69. SUBTENDENS



70. FUSCICORNIS



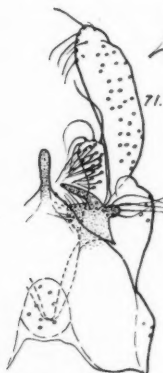
71. QUADRIPUNCTATUS



72. ATER



74A. JUCUNDUS



74B. JUCUNDUS



75. CORACINUS



76. ALBESCENS



77. PROFUSUS



78. OBEDIENS



79. DYARI



80. FLAVIPES



81. PUNCTIPES



82. VITTATUS



83. PALLIATUS



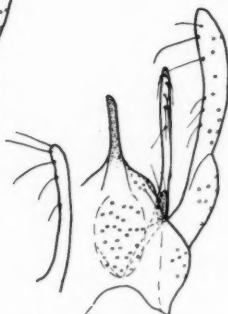
87. MARMOREUS



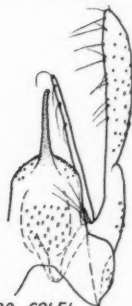
96. CINCTUS



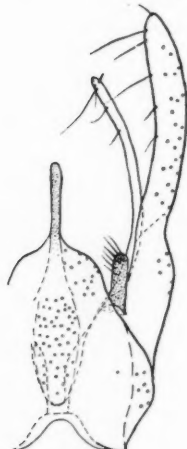
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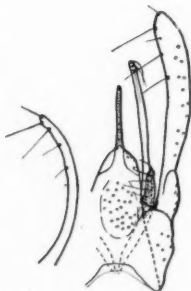
98. PULCHRIENNIS



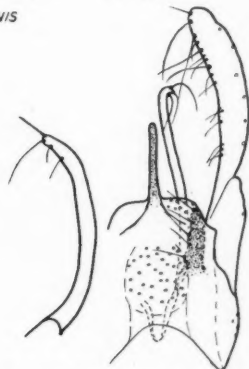
99. COLEI



100. UNICTUS



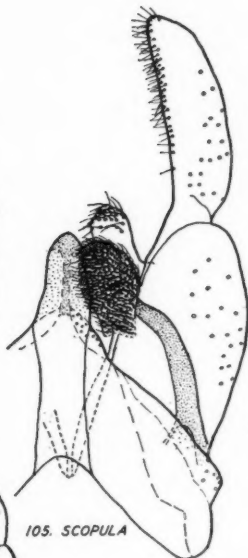
101. MACATEEI



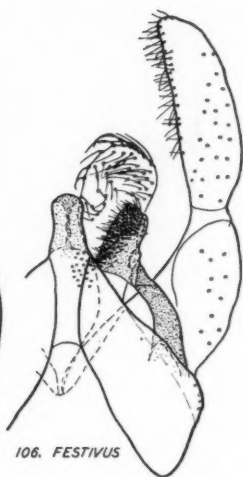
103. TAENIAPENNIS



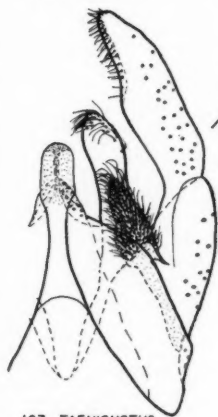
104. XENOLABIS



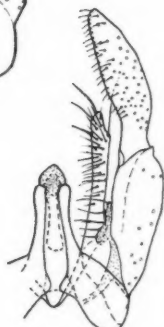
105. SCOPULA



106. FESTIVUS



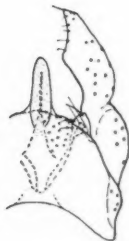
107. TAENIONOTUS



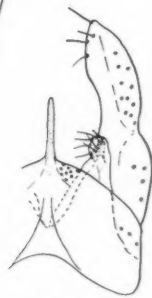
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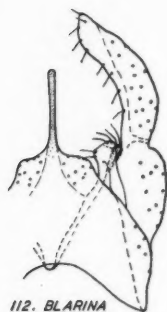
109. SOREX



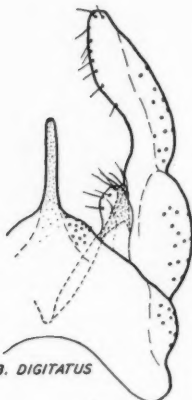
110. SCIMITARUS



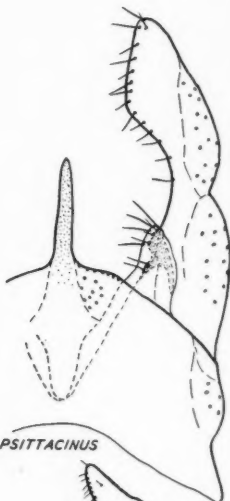
111. FULVUS



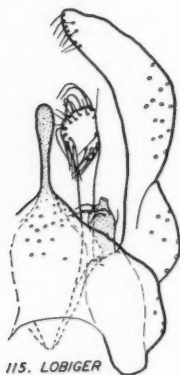
112. BLARINA



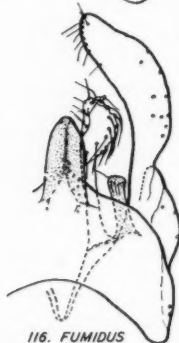
113. DIGITATUS



114. PSITTACINUS



115. LOBIGER



116. FUMIDUS



117. LEUCOSCELIS



118. CALIFORNICUS



119. MODESTUS



120. NEOMODESTUS



121. AETHIOPS



122A. NERVOSUS



122B. NERVOSUS



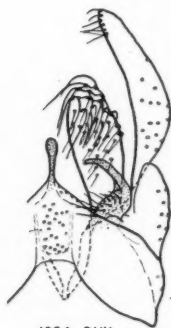
122C. NERVOSUS



123. BOTAURUS



124. MILLERI



125A. DUX



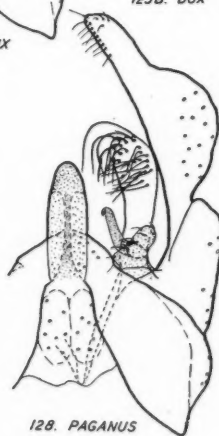
125B. DUX



126. BRUNNEIPENNIS



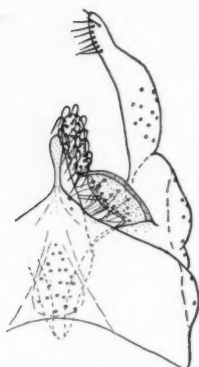
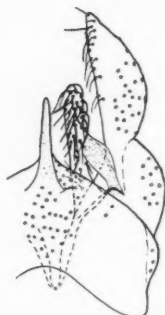
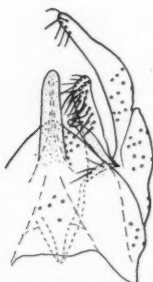
127. DORSALIS



128. PAGANUS



129. CHELONIA

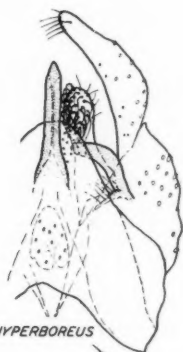
130. *ATROVIRIDIS*131. *OGHREATUS*132. *CARUS*133. *FULVIPILUS*134. *PUNGENS*135. *STIGMATERUS*136A. *DECORUS*136B. *DECORUS*136C. *DECORUS*136D. *DECORUS*137. *TUXIS*138. *ATRELLA*



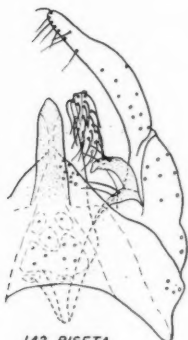
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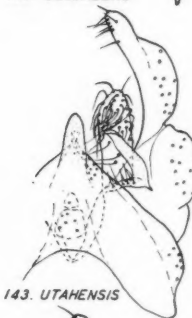
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141. *HYPERBOREUS*



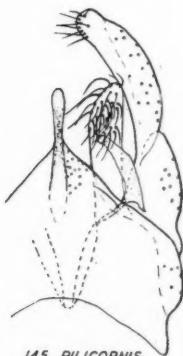
142. *BISETA*



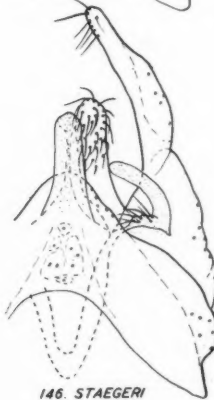
143. *UTAHENSIS*



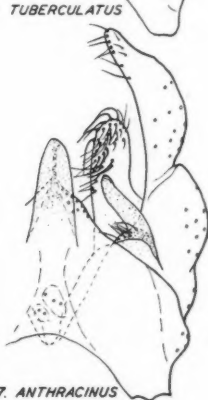
144. *TUBERCULATUS*



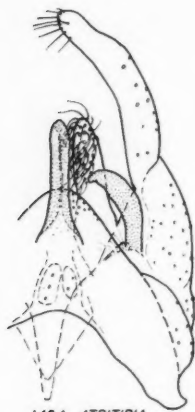
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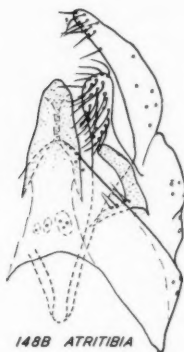
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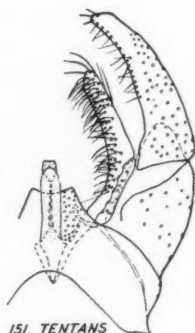
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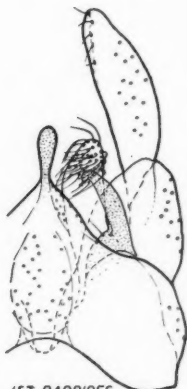
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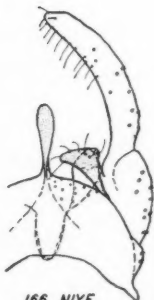
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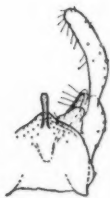
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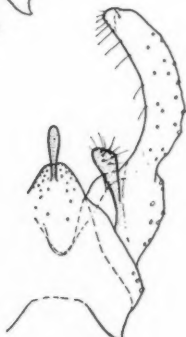
169. NEREIS



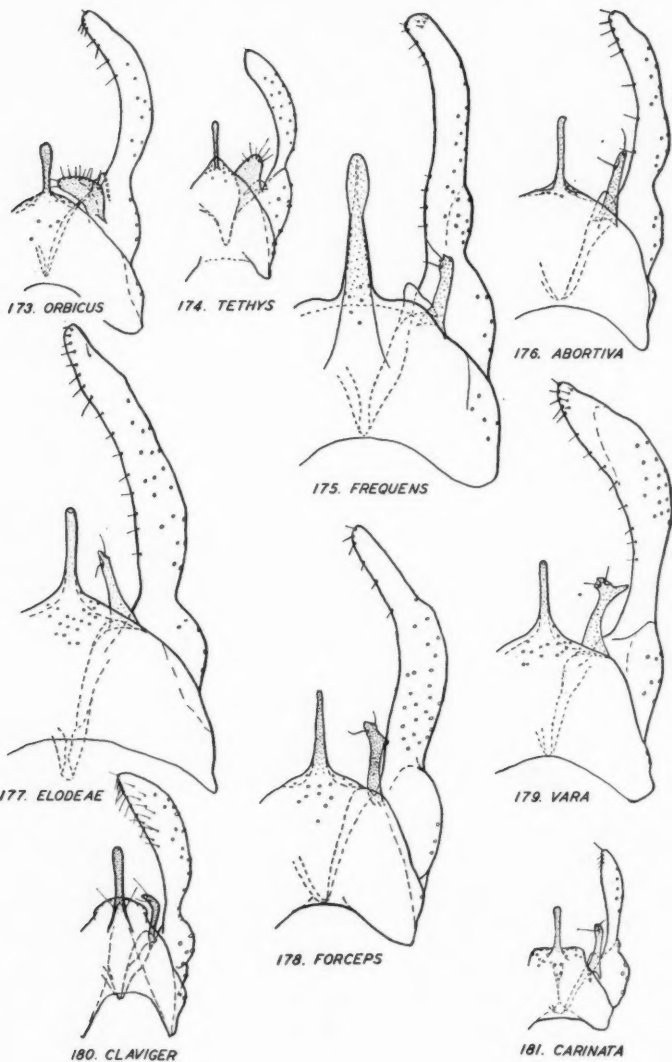
170. TYTUS

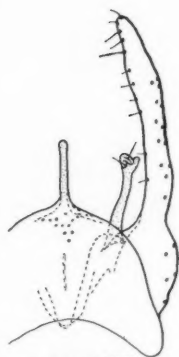


171. DORIS

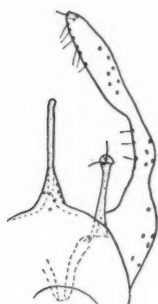


172. AMPHITRITE

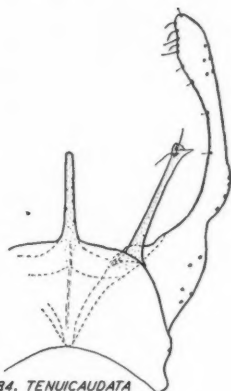




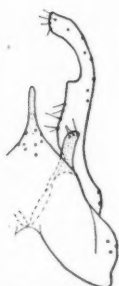
182. POTAMOGETI



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184. TENUICAUDATA



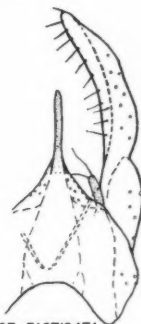
185. EMORSA



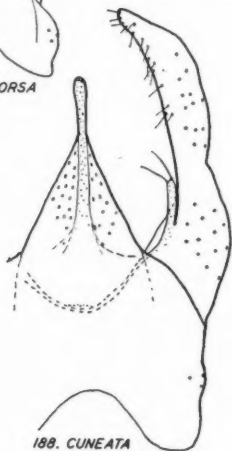
186A. CASUARIA



186B. CASUARIA



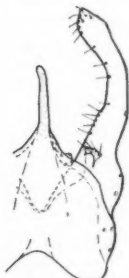
187. FASTIGATA



188. CUNEATA

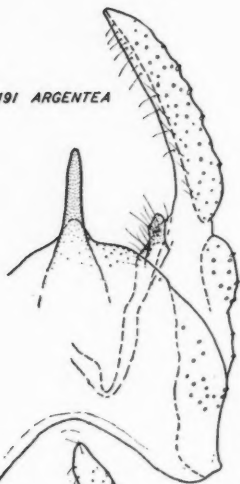


189. NIGROVITTATA



190. PSEUDOTENER

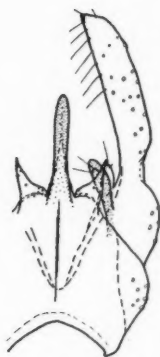
191. ARGENTEA



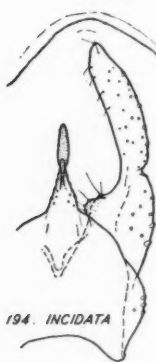
192. GRISEA



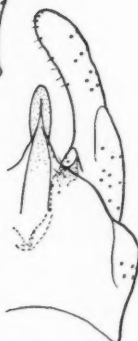
193. ALBOVIRIDIS



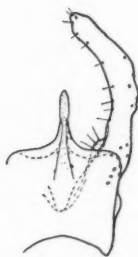
194. INCIDATA



195. CURTILAMELLATA



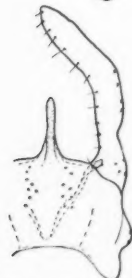
196. EDWARDSI



197. SPECTABILIS



198. AMACHAERUS



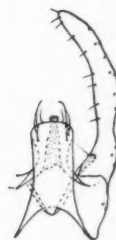
199. VIRIDULUS



200. COLLATOR



201. GALEATOR

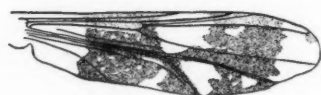




202. VARIPENNIS ♂



209. PARVUM ♂



203. PERPULCHER ♂



210. PARDUS ♂



204. THERMOPHILUS ♂



211. LABECULOSUM ♂



205. ELACHISTUS ♂



212. GRISEOPUNCTATUM ♂



206. SCALAENUM ♂



213. NUBECULOSUM ♂



207. APICATUM ♂



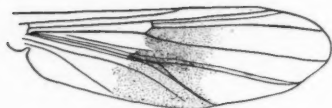
214A. LAETUM ♂



208. PTEROSPILUS ♂



214B. LAETUM ♂



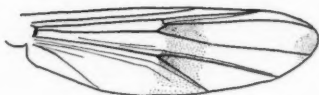
215. FALLAX CALOPTERUS ♀



221A. COLEI ♂



216. NAEVUS ♀



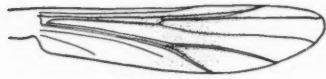
221B. COLEI ♀



217. MARMOREUS ♂



222. UNICTUS ♂



218. BROWNI ♂



223. HILARIS ♂



219. POECILOPTERUS ♂



224. TAENIAPENNIS ♂



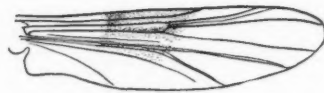
220A. PULCHRIPENNIS ♂



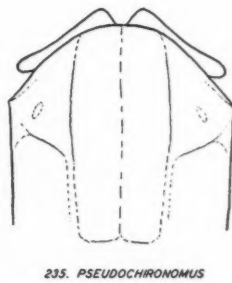
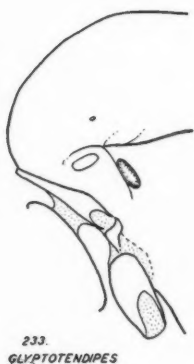
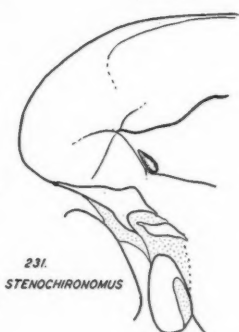
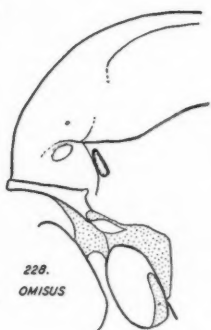
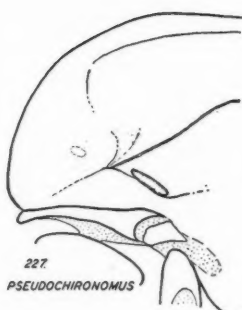
225. DECORUS ♂

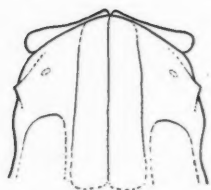


220B. PULCHRIPENNIS ♀

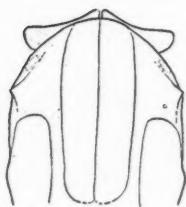


226. BRACHIALIS ♂

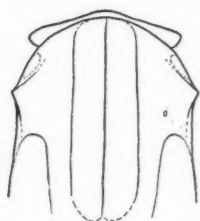




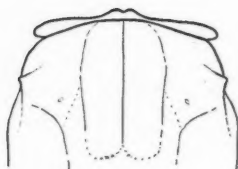
236. TANYTARSUS



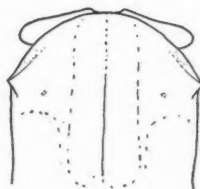
237. XENOCHIRONOMUS



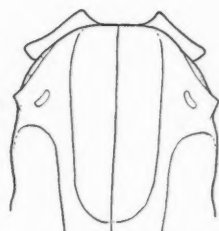
238. CRYPTOCHIRONOMUS



239. TENDIPES



240. GLYPTOTENDIPES



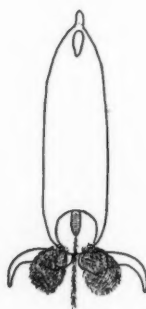
241. GLYPTOTENDIPES



242. PARATENDIPES



243. POLYPEDIUM



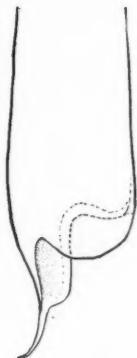
244. TENDIPES



245. PSEUDOCCHIRONOMUS



246. *PARATENDIPES*



247. *KRIBIOXENUS*



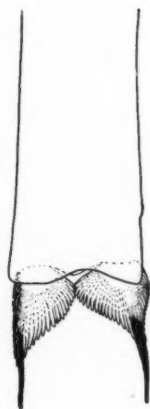
248. *POLYPEDILUM*



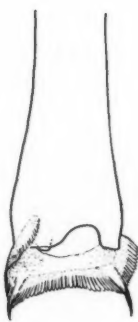
249. *TANYTARSUS*



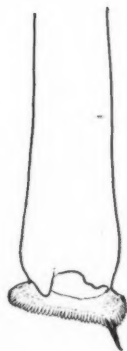
250. *TENDIPES*



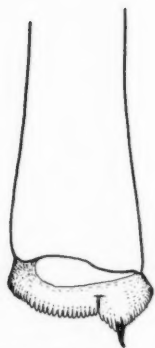
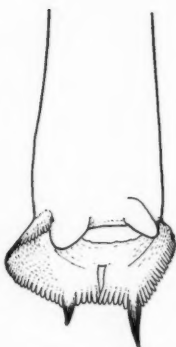
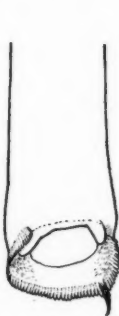
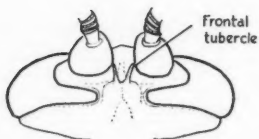
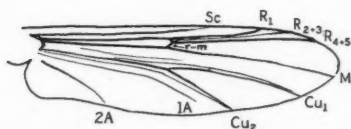
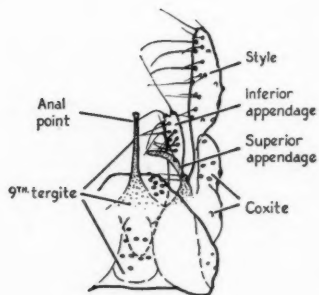
251. *PSEUDOCHIRONOMUS*



252. *PARATENDIPES*



253. *APEDILUM*

254. *POLYPEDILUM*255. *TANYTARSUS*
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The Leguminosae in Iowa*

William B. Fox

This taxonomic study deals with all leguminous plants, both native and established, known by the writer to occur in Iowa. It is an attempt, first, to present a useful and simplified treatment of the species of this large and diversified family which occur in Iowa, and secondly, to show the distribution of these species within the state so far as is indicated by the collections studied. A key to the genera considered and keys to the species of all genera containing more than two species are provided. Brief supporting descriptions are given for most of the species and for a few genera where additions to the characters given in the key seems advisable.

An attempt has been made to bring the nomenclature up to date. Investigations by recent workers have shown that certain familiar specific names are invalid under the International Rules of Botanical Nomenclature and must be discarded. Other changes recognized are based on changed taxonomic concepts. Synonyms are listed wherever the names used differ from those in currently used manuals of the flora of the region. The sequence of genera follows that used in Gray's Manual, 7th Edition.

The Leguminosae constitutes a conspicuous part of the state flora, making up about one-eighteenth of the total number of species; in this respect ranking fourth, exceeded only by the Compositae, Gramineae and Cyperaceae.

Eighty-one species of legumes are compiled for the state by Green (1907). Seventy-eight species and varieties are listed by Cratty (1933). Cratty's list was based solely on specimens in the herbarium of the Iowa State College. Some species and varieties included in the above lists are excluded in the present treatment because of insufficient evidence of the establishment of certain introduced species or because of what, in the writer's opinion, was incorrect identification.

Eighty-six species and varieties in 31 genera are here recognized as a part of our native and established flora. Of this number, 65 are believed to be native, and the remaining 21 are regarded as introduced or adventive. This increase in the total number of known legume species and varieties in Iowa is in large part the result of a critical study of the legume specimens in the extensive collections made by Bohumil Shimek and now deposited in the herbarium of the State University of Iowa. This collection was made over the entire state throughout Shimek's forty years of active study of its flora.

A study of the distribution as based on collections examined reveals several outstanding patterns among the native species of the Leguminosae in Iowa. These are as follows:

* Adapted from a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Botany, in the Graduate College of the State University of Iowa, Iowa City, Iowa, July 1942.

(1) Common or infrequent throughout most of the state: *Amorpha canescens*, *A. fruticosa* var. *angustifolia*, *Amphicarpa bracteata*, *A. bracteata* var. *comosa*, *Apios americana*, *Astragalus canadensis*, *Baptisia leucantha*, *B. leucophaea*, *Cassia fasciculata*, *Glycyrrhiza lepidota*, *Gymnocladus dioica*, *Desmodium acuminatum*, *D. bracteosum* var. *longifolium*, *D. canadense*, *D. canescens*, *D. illinoense*, *Lathyrus palustris*, *Lespedeza capitata*, *Petalostemon candidus*, *P. purpureus*, *Strophostyles helvola*, *S. leiosperma*, *Vicia americana*.

(2) Western border counties and counties immediately adjacent: *Astragalus lotiflorus*, *A. missouriensis*, *Dalea enneandra*, *Oxytropis Lamberti*, *Petalostemon multiflorus* and *P. occidentalis*.

(3) Essentially confined to the western half of the state: *Amorpha nana*, *Psoralea argophylla* and *P. esculenta*.

(4) Northern half of state: *Lathyrus ochroleucus* and *L. venosus* var. *intonus*. *Lespedeza leptostachya* seems to be confined to the counties on or near the northern border.

(5) Scattered in the eastern half of the state: *Desmodium nudiflorum*, *D. paniculatum* and *Tephrosia virginiana* var. *holosericea*.

(6) Southeastern part of the state: *Astragalus distortus*, *Cassia marilandica*, *Cercis canadensis* (also in the southwestern corner), *Desmodium Dillenii*, *Lespedeza repens*, *L. violacea*, *L. virginica* and *Psoralea Onobrychis*.

Astragalus hypoglottis has a peculiar local distribution in the counties in the lake region of northwestern Iowa.

The writer is grateful to Dr. W. A. Anderson, under whose supervision this work was carried on, for valuable suggestions and criticism; to Dr. George Goodman of Iowa State College for several loans of specimens and for kindly making available the facilities of the herbarium of that institution and to Professor Charles Carter for his generous loan of the Parsons College specimens.

KEY TO THE GENERA

- A. Plants woody, at least at base.
 - B. Trees.
 - C. Leaves simple, cordate6. *Cercis*
 - CC. Leaves compound.
 - Leaves mostly bipinnate, leaflets not stipellate.
 - Leaflets ovate, acute; plant unarmed; flowers 1.5 cm. long; pods hard and woody.....7. *Gymnocladus*
 - Leaflets oblong or oval, obtuse; plant usually armed; flowers minute; pods leathery4. *Gleditsia*
 - Leaves simply odd-pinnate, leaflets stipellate.....20. *Robinia*
 - BB. Shrubs or suffrutescent plants.
 - Leaflets glandular dotted, stipellate; corolla consisting of standard only.....16. *Amorpha*
 - Leaflets not glandular dotted, not stipellate; corolla perfectly papilionaceous19. *Tephrosia*
- AA. Plants herbaceous.
 - D. Leaves simple, with decurrent stipules8. *Crotalaria*
 - DD. Leaves compound.
 - E. Leaves ending in tendrils.

- Style terete, bearded around the apex; wings coherent with the keel;
stamen tube oblique at the summit.....27. *Vicia*
- Style flattened toward the apex, bearded down the inner face, wings nearly
free from the keel; stamen tube truncate at summit.....28. *Lathyrus*
- EE. Leaves not ending in tendrils.
- F. Leaves bipinnate, with numerous leaflets.
- Stems, petioles and pods prickly; flowers pinkish; petals united
below; pods terete, 4-valved2. *Schrankia*
- Stems, etc., not prickly; flowers greenish-white; pods flat.....1. *Desmanthus*
- FF. Leaves trifoliate or digitately 5-11-foliate.
- G. Stamens distinct, pods inflated.....7. *Baptisia*
- GG. Stamens monadelphous or diadelphous, pods not inflated.
- H. Leaflets dentate or denticulate.
- Flowers capitate or in short spikes.
- Petals adherent to the stamen tube; pods straight, included in
calyx10. *Trifolium*
- Petals free from stamen tube; pods curved or coiled.....12. *Medicago*
- Flowers in slender racemes; petals free from stamen tube; pods
straight, longer than calyx11. *Melilotus*
- HH. Leaflets entire.
- Leaflets glandular-dotted.....15. *Psoralea*
- Leaflets not glandular-dotted.
- Flowers solitary or umbellate; plants not twining.....14. *Lotus*
- Flowers racemose, capitate or paniced.
- Leaves digitately 7-11 foliate.....9. *Lupinus*
- Leaves trifoliate.
- Pods 1-seeded or consisting of 2-8 1-seeded joints; not
twining.
- Leaflets stipellate; pods jointed, with hooked hairs.....25. *Desmodium*
- Leaflets not stipellate; pods 1-seeded, without hooked
hairs26. *Lespedeza*
- Pods linear, elongated, several-seeded, twining herbs.
- Flowers (i.e., aerial ones) in racemes; keel almost
straight; style beardless; pods more copiously
hairy on the sutures.....31. *Amphicarpa*
- Flowers capitate, few, on long peduncles; keel strongly
curved; style bearded; pods uniformly pubescent
.....30. *Strophostyles*
- FFF. Leaves pinnate, with 5 or more leaflets.
- I. Leaves even-pinnate; petioles with 1 or 2 stalked glands; flowers
almost regular.....5. *Cassia*
- II. Leaves odd-pinnate; petioles without stalked glands; flowers papilion-
aceous.
- J. Crawling or sprawling vines; keel spirally twisted.....29. *Apios*
- JJ. Not vines; keel not spirally twisted.
- K. Foliage glandular-punctate.
- Petals free from the stamen tube; leaflets averaging more than 6
mm. wide; pods prickly.....23. *Glycyrrhiza*
- Petals borne on the stamen tube; leaflets less than 6 mm. wide;
pods not prickly.
- Stamens 10; leaflets more than 9, or if less, the spikes very
loosely flowered with conspicuous, ovate bracts.....17. *Dalea*
- Stamens 5; leaflets 5-9; spikes usually compact.....18. *Petalostemon*
- KK. Foliage not glandular-punctate.
- L. Flowers umbellate or capitate.
- Inflorescence with conspicuous, 3-5 lobed involucre bracts;
stamens monadelphous; pods short, enclosed by the calyx
.....13. *Anthyllis*

- Inflorescence not as above; stamens diadelphous; pods 2-5 cm. long.
 Leaflets 11-25; flowers pinkish; pods 4-angled, jointed....
24. *Coronilla*
 Leaflets 5, the lower pair simulating stipules; flowers yellowish; pods flat, jointed14. *Lotus*
 L.L. Flowers in racemes or spikes.
 Standard orbicular; pods flat; stipules narrow, early deciduous19. *Tephrosia*
 Standard oblong; pods turgid or inflated; stipules ovate or triangular, persistent.
 Keel tipped with an erect, short point; plants acaulescent; with leaflets linear-lanceolate, usually more than 6 times as long as broad22. *Oxytropis*
 Keel not appendaged; if acaulescent, with ovate leaflets....
21. *Astragalus*

Taxonomic Treatment of the Species

1. DESMANTHUS Willd.

1. *D. illinoensis* (Michx.) MacM. ex. Robinson and Fern. Gray's Man., Ed. 7, 503. 1908.

Acuan illinoensis (Michx.) Kuntze, Rev. Gen. Pl., 158. 1891.

Erect, perennial herb, appressed-pubescent; 15-24 pairs of oblong-linear leaflets; flowers perfect or staminate, on axillary peduncles; pods curved, numerous, in dense heads.

Alluvial prairies and lake borders, infrequent in western part of state, also collected in Wapello and Jefferson counties in southeastern Iowa.

2. SCHRANKIA Willd.

1. *S. uncinata* Willd. Sp. Pl. 4:1043. 1806.

Morongia (Willd.) Britton, Mem. Torr. Bot. Club 5:191. 1894.

Leptoglottis Nuttallii D. C. Mem. Leg. 451. 1825.

Perennial herb, procumbent, recurved-prickly; leaves sensitive; leaflets prominently veined beneath; flowers in round heads on axillary peduncles.

Collected in Tama County (Fellows, 1895) and Mills County (B. Shimek, 1925).

3. GYMNOCLADUS Lam.

1. *G. dioica* (L.) Koch, Dendrol. 1:5. 1869.

G. canadensis Lam. Encyl. 1. 733. 1783.

A tall, unarmed tree; leaves large, with lower divisions of the bipinnate leaves of simple leaflets; flowers white, dioecious or polygamous; regular.

In alluvial woods, or in upland woods not far from streams, common in eastern part of the state, infrequent in central part and more frequent in counties along the Missouri River.

4. GLEDITSIA L.

- 1.
- G. triacanthos*
- L. Sp. Pl. 1056. 1753.

Tree, armed with stout, branching thorns; an unarmed form may occasionally be found; *f. inermis* (Pursh) Fassett, *Rhodora* 38:97 (1936).

Infrequent throughout the southern half of the state, commoner eastward, in alluvial or upland woods; often planted.

5. CASSIA (Tourn.) L.

- 1.
- C. fasciculata*
- Michx. Fl. Bor. Am. 1:262. 1803.

C. Chamaecrista of Gray's Manual, ed. 7, not of Linnaeus; see Pennell, Bull. Torr. Bot. Club 44:347-348. 1917.

Annual, 3-9 dm. tall, with short incurved pubescence; leaflets 14-30, 8-16 mm. long, 2-5 mm. wide, obliquely oblong or oblong-linear; flowers 10-18 mm. long, yellow, often purple-spotted; legumes short-beaked, appressed-puberulent on the sutures.

In moist or dry, sandy soil and on prairies; infrequent but locally abundant throughout the state.

- 2.
- C. marilandica*
- L. Sp. Pl. 378. 1753.

C. Medsgeri Shafer, *Torreya* 4:179. 1904. (See Fernald, *Rhodora* 39:410-414, 1937).

Perennial or biennial, glabrous or minutely appressed-pubescent, 1-1.5 m. tall; leaflets 10-20, 2.5-5 cm. long, 1-2 cm. wide; petiolar gland stout-cylindric or conical, sessile or subsessile; stipules linear lanceolate, 1-2 mm. wide; ovaries with short, appressed pubescence; legumes glabrous or minutely pubescent, the joints broader than long.

Low sandy ground, eastern and southern parts of the state.

6. CERCIS L.

- 1.
- Cercis canadensis*
- L. Sp. Pl. 374. 1753.

Small tree with simple cordate leaves; flowers perfect, pink purple, appearing before the leaves, in fascicles on older branches.

Infrequent in woodlands in the southeastern quarter of the state and has been collected in Fremont and Mills Counties.

7. BAPTISIA Vent.

Leaflets usually less than 2 cm. long; flowers yellow, in terminal racemes; wings and keel usually less than .5 cm. long

.....1. *B. tinctoria*
Leaflets 2-10 cm. long; flowers white or cream-colored, usually in lateral racemes; wings and keel 2-3 cm. long.

Glabrous, 1-2 m. tall; bracts and stipules small and usually deciduous; leaflets obtuse; pedicels less than 1 cm. long; stipe of pod 2-3 times as long as calyx

.....2. *B. leucantha*
Villous, 3-5 dm. tall; bracts and stipules large, foliaceous, and persistent; leaflets acute; pedicels 1-5 cm. long; stipe of pod shorter than calyx

.....3. *B. leucophaea*

- 1.
- B. tinctoria*
- (L.) Vent. Dec. Gen. Nov. 9. 1809.

B. tinctoria (L.) R. Br. of recent manuals.

In sandy places and prairie openings; collected in Madison Co., on Backbone, s. of Winterset by B. Shimek in 1917.

2. *B. leucantha* T. & G. Fl. N. A. 1:385. 1840.

Stipules lanceolate, soon falling away; pod black, glaucous and glabrous.

On sand and in prairies and fields, infrequent throughout the state.

3. *B. leucophaea* Nutt. Gen. N. A. Pl. 1:282. 1818.

B. bracteata (Muhl.) Ell. of Britton and Brown, Ill. Fl. of N. U. S. and Gray's Manual, Ed 7., not of Small's Manual of S. E. Flora, 1933.

Leaflets oblanceolate, acute at both ends; large stipules with almost sessile leaflets simulating 5-foliate leaves; pod densely pubescent. A glabrate form, otherwise similar, may rarely occur.

Prairies, fairly common throughout most of the state, uncommon in Missouri Valley.

8. *CROTALARIA* L.

1. *C. sagittalis* L. Sp. Pl. 714. 1753.

Annual, 2-6 dm. tall with tawny hairs on leaves and stem; leaves ovate or lanceolate; decurrent stipules together inversely arrow-shaped; flowers yellow; pod glabrous, papery with loose rattling seeds at maturity.

On dry, sandy soil and on prairies in the eastern half of the state but infrequent across the southern half of the state to the Missouri Valley.

9. *LUPINUS* (Tourn.) L.

1. *L. perennis* L. Sp. Pl. 721. 1753.

Stem 3-6 dm. tall from a deep perennial root; leaflets oblanceolate, flowers in a terminal raceme, blue to white; pods densely hirsute.

Three specimens from this state have been seen by the writer, all collected at Decorah, Winneshiek Co., by Holway in 1893, growing in sand. They have the copious, long, spreading pubescence of the western phase of the species, var. *occidentalis* S. Wats., Proc. Am. Acad. 8:530. 1873.

10. *TRIFOLIUM* (Tourn.) L.

Flowers sessile or nearly so, in dense heads, not reflexed in age, corolla pink, purple or red.

Heads cylindrical, usually much longer than thick, peduncled; annuals.

Calyx exceeding corolla, silky-plumose; corolla white; leaflets narrow.....1. *T. arvense*

Calyx shorter than corolla, villous with brown hairs; corolla crimson, leaflets broad.....2. *T. incarnatum*

Heads globose to short cylindric, sessile or nearly so; perennial.....3. *T. pratense*

Flowers pedicelled, reflexed in age.

Flowers white to red, often purplish.

Calyx lobes 1.5-3 mm. long; length of peduncles many times diameter of head.

Stems ascending, not stoloniferous; calyx lobes subulate, not dilated at base,

1.2-2 times as long as tube.....4. *T. hybridum*

Stems creeping, rooting at nodes; calyx lobes dilated at base (i.e., with membranous margins), shorter than or barely equalling the length of tube

.....5. *T. repens*

Calyx lobes 4-6 mm. long; peduncles short, 1-4 times diameter of head.

Plant suberect, often branched at base, not stoloniferous, 1-5 dm. high.

Leaves and calyx pubescent6. *T. reflexum*

Leaves and calyx glabrous7. *T. reflexum* var. *glabrum*

Plant creeping, stoloniferous, essentially glabrous 1-3 dm. long....8. *T. stoloniferum*

Flowers yellow

Terminal leaflet sessile or nearly so; stipules lanceolate; standard conspicuously striate when dry.....9. *T. agrarium*

Terminal leaflet stalked, stipules ovate.

Heads dense, 20-40 flowered; standard conspicuously striate when dry.....10. *T. procumbens*

Heads loose, 5-12 flowered, standard scarcely striate when dry.....11. *T. dubium*

1. *T. arvense* L. Sp. Pl. 769. 1753.

Dry, sandy soil. Naturalized, not very common. The writer has seen specimens collected in Davis, Des Moines, Emmet, Hancock, Johnson, Story and Winneshiek Counties. It doubtless occurs elsewhere in the state.

2. *T. incarnatum* L. Sp. Pl. 769. 1753.

Escaping from cultivation. Specimens have been seen by the writer from Dallas, Fayette and Iowa Counties.

3. *T. pratense* L. Sp. Pl. 768. 1753.

Extensively cultivated and frequently escaping; probably established throughout the state in fields and meadows and along roadsides.

4. *T. hybridum* L. Sp. Pl. 766. 1753.

Stems often 6 dm. long and 5-6 mm. in diameter; peduncles 5-10 cm. long arising from upper axils; corolla pinkish.

In meadows, fields, etc., escaping from cultivation; specimens examined from 46 Iowa Counties scattered all over the state indicate that it is well established throughout.

5. *T. repens* L. Sp. Pl. 767. 1753.

Stems low and creeping, rooted tightly to the soil, seldom over 2.5 mm. in diameter, bearing very long, erect peduncles; flowers white.

Fields and open places; probably common throughout the state.

6. *T. reflexum* L. Sp. Pl. 766. 1753.

The typical plant, having leaves and calyx pubescent, has not been seen by the writer in any material collected in Iowa. All specimens examined are the glabrous variety below. It was reported in the State Horticultural Society's list, "Plants of Iowa," 1907, but this may have been based on the glabrous variety.

7. *T. reflexum* var. *glabrum* Lojacono in Nuov. Giorn. Bot. Ital. 15:150. 1883.

This may be confused with *T. stoloniferum* which is also essentially glabrous. *T. reflexum* var. *glabrum* is never stoloniferous, though usually much branched at base, the branches ascending, and has oblong leaves and 4-seeded pods.

Specimens collected in Muscatine, Louisa, Linn, Johnson, Pottawatamie

and Van Buren Counties have been seen by the writer.

8. *T. stoloniferum* Muhl. Cat. 70. 1813.

This glabrous, stoloniferous species, generally smaller than the two preceding, has been reported for the state, but all specimens labelled such in the S. U. I. Herbarium proved to be No. 7. Though the writer has not seen any record for Iowa, it is possible that it occurs in the southern part.

9. *T. agrarium* L. Sp. Pl. 772. 1753.

Larger and more erect than *T. procumbens* which it resembles; specimens seen from Allamakee, Buchanan, Floyd, Jackson, Madison, Mitchell, Story and Van Buren Counties.

10. *T. procumbens* L. Sp. Pl. 772. 1753.

Low and spreading; confused with *Medicago lupulina* L. but may be easily distinguished by its striate petals, its short uncurved pod, round stem, and by having $\frac{1}{2}$ the length of the stipule fused with the petiole, whereas only $\frac{1}{4}$ - $\frac{1}{3}$ of the length is fused in the Black Medick.

Sandy fields and roadsides; probably infrequent throughout state.

11. *T. dubium* Sibth. Fl. Oxon. 231. 1794.

One specimen in the Parson's College Herbarium, labelled *T. procumbens*, collected in Fairfield, Jefferson County, has the low-straggling habit, narrowly obcordate leaves and 3-10 flowered heads of this species.

11. MELILOTUS (Tourn.) L.

Flowers white, standard exceeding wings by 0.5-1 mm.; calyx mainly tapering at base; mature fruit reticulated.....1. *M. alba*
Flowers yellow, standard and wings about equal; calyx rounded or gibbous at base; mature fruit cross-ribbed2. *M. officinalis*

1. *M. alba* Desr. in Lam. Encyc. 4:63. 1797.

Weed, along roadsides, in fields and waste places throughout state.

2. *M. officinalis* (L.) Lam. Fl. Fr. 2:594. 1778.

Weed, locally abundant in similar situations throughout state.

12. MEDICAGO (Tourn.) L.

Perennials essentially glabrous, erect; corolla 6-10 mm. long; leaflets more than twice as long as broad; pods 2-several seeded.

Flowers purple; pods coiled 2-3 times; leaflets oblong-obovate to linear-oblancoate1. *M. sativa*
Flowers yellow; pods flat, strongly curved; leaflets linear.....2. *M. falcata*
Annual, decumbent or spreading, pubescent; leaflets obovate or oval, less than twice as long as broad; flowers yellow; pods 1-seeded.....3. *M. lupulina*

1. *M. sativa* L. Sp. Pl. 778. 1753.

Cultivated and often escaping throughout the state.

2. *M. falcata* L. Sp. Pl. 779. 1753.

Adventitious; specimens seen from Marshall, Ringgold, Sac and Story Counties.

3. *M. lupulina* L. Sp. Pl. 779. 1753.

Stem square in cross-section; stipules ovate-lanceolate, $\frac{1}{4}$ - $\frac{1}{3}$ of their lengths fused with the petioles; pods black, strongly curved, reticulated.

Common locally as a weed in field and lawns, along railroad tracks and in waste places.

13. ANTHYLLIS (Tourn.) L.

1. *A. Vulneraria* L. Sp. Pl. 719. 1753.

An Old World species, collected in Wright Co. (Hayden, 1935) and Story Co. (Robertson, 1927); probably established elsewhere in the state as it is often spread in clover seed.

14. LOTUS (Tourn.) L.

Petals free from stamen tube; flowers umbellate or solitary; in our species, leaflets 1-5 and pods linear, 2-4 cm. long.

1. *L. americanus* (Nutt.) Bisch. Del. Sem. Hort. Heidlb. 1839.

Hosackia purshiana Lindl. Bot. Reg., Pl. 1257. 1829.

H. americana Piper Contr. U. S. Nat. Herbarium 11:366. 1906.

Acmispon americanus Rydb. Bull. Torr. Bot. Club 40:45. 1913. See Ottley, Rev. Cal. Species of Lotus, U. of Cal. Publ. 10:189-205. 1923.

Annual plant, much branched, villous, or glabrate; leaflets mainly 3, often 1 above, oblong, acute; stipules reduced to black glands; axillary peduncles short, 1-2 flowered; flowers rose color, tinged with yellow, 4-6 mm. long.

Prairies; specimens seen by the writer from Lyon, Sioux, Story, Chicksaw, and Henry Counties.

2. *L. corniculatus* L. Sp. Pl. 775. 1753.

Perennial, decumbent or ascending, appressed-pubescent or glabrate; leaflets 5, lower pair simulating stipules; flowers bright yellow, 1-2 cm. long, in 3-10 flowered umbels on long peduncles.

This Old World species has been collected growing on a prairie n. of Mapleton, Monona Co., by B. Shimek in 1909, and in the herbarium of Iowa State College is a specimen marked "introduced accidentally at college," 1876.

15. PSORALEA L.

Leaves digitately 3-5 foliate (all leaflets from same point). Stems and petioles pubescent.

Pubescence of stem and petiole appressed; stems much branched; inflorescence loose; tap root slender; leaflets glandular-punctate.

Pods silky; flowers sessile; calyx densely white-wooly; whole plant densely silver pubescent 1. *P. argophylla*

Pods glabrous but glandular; flowers pedicelled, calyx appressed-canescant.... 2. *P. tenuiflora* var. *floribunda*

Pubescence of stem and petioles of long white spreading hairs; stems little

- branched; inflorescence a dense, spikelike raceme; tap root tuberous; leaflets not glandular-punctate.....3. *P. esculenta*
 Stems and petioles essentially glabrous; conspicuously punctate; leaflets linear-lanceolate; petioles about equalling the leaflets.....4. *P. lanceolata*
 Leaves pinnate, trifoliate (terminal leaflet stalked); leaflets 5-10 cm. long, 2-5 cm. wide, ovate lanceolate.....5. *P. Onobrychis*

1. *P. argophylla* Pursh, Fl. Am. Sept. 475. 1814.

Psoralidium argophyllum (Pursh.) Rydb., N. A. Fl. 24:16. 1919.

Prairies, very common in western half of state and less frequent across the northern part.

2. *P. tenuiflora* var. *floribunda* (Nutt.) Rydb. Fl. Neb. 21:55. 1895.

P. floribunda Nutt., T. & G. Fl. N. A. 1:300. 1838.

Psoralidium floribundum Rydb., N. A. Fl. 24:15. 1919.

Erect, 3-12 dm. tall, much branched, stem canescent, not glandular; leaves 3-5 foliate, stem leaves usually 5-foliate; leaflets glandular, appressed-canescens below, green with a few hairs on midrib above, often rugose, 1-4.5 cm. long, 3-10 mm. wide, oblong; petioles 3-20 mm. long; flowers 5-7 mm. long, numerous, 3-8 at each node in racemes on peduncles 6-15 cm. long; calyx densely canescent, with triangular lobes; pod glabrous, glandular punctate, 5-9 mm. long.

It is the writer's opinion that none of the Iowa specimens seen are typical *P. tenuiflora* which is smaller, less pubescent and more conspicuously glandular throughout, with few-flowered, short racemes and with calyx lobes lanceolate and sparsely hairy.

On prairies, uncommon, mainly in the southern part of the state.

3. *P. esculenta* Pursh, Fl. Am. Sept. 475. 1814.

Pediomelum esculentum (Pursh) Rydb., N. A. Fl. 24:20. 1919.

Prairies, western counties of state. Also collected in Winneshiek Co.

4. *P. lanceolata* Pursh, Fl. Am. Sept. 475. 1814.

Psoralidium lanceolatum (Pursh) Rydb., N. A. Fl. 24:13. 1919.

The writer has seen one specimen, collected by L. H. Pammel at Onawa, Monona Co., 1923. Vail (1894) cites a specimen collected by A. S. Hitchcock at Sioux City, Woodbury Co., in 1888. It may occur in other Missouri Valley Counties.

5. *P. Onobrychis* Nutt., Gen. N. A. Pl. 2:104. 1818.

Orbexilum Onobrychis (Nutt.) Rydb., N. A. Fl. 24:5. 1919.

Stem erect 1-1.5 m. high, glabrous or finely pubescent; racemes elongated, on peduncles 6-15 cm. long; pod flat, rugose, with a curved beak.

Specimens have been seen by the writer from Lee and Des Moines Counties.

16. AMORPHA L.

Shrubs with odd-pinnately compound leaves; leaflets, calyx and pod glandular-punctate; flowers in elongate cylindrical spikes; corolla of one petal, the purple standard; the stamens exserted, monadelphous below.

Calyx lobes lanceolate or linear, at least $\frac{1}{2}$ as long as the tube; leaflets less than 2 cm. long; shrubs usually less than 1 meter high.

Densely and softly canescent; leaflets thin; spikes clustered at summit.....

.....1. *A. canescens*

Essentially glabrous; leaflets coriaceous; spikes usually solitary at ends of branches.....

.....2. *A. nana*

Calyx lobes deltoid or rounded, less than $\frac{1}{4}$ as long as the tube; leaflets 2-4 cm. long; shrubs 1-4 m. high.

Pubescence of midribs and petiolules curled and matted; leaflets usually rounded at base, about twice as long as broad.....

.....3. *A. fruticosa*

Pubescence of midribs and petiolules appressed, often sparse; leaflets usually cuneate at base, 3-6 times as long as broad.....

.....4. *A. fruticosa* var. *angustifolia*

1. *A. canescens* Pursh, Fl. Am. Sept. 467. 1814.

Usually herbaceous toward tip; leaflets often becoming somewhat smooth above; calyx lobes subulate, as long as or longer than the tube; pod densely villous with grayish hairs.

Common on prairies and on dry, gravelly banks throughout the state; specimens examined from eighty-two counties of state.

2. *A. nana* Nutt. Fras. Cat. 1813: reprinted in Pittonia 2:116. 1890. See Palmer, Journ. Arn. Arb. 12:173. 1931.

A. microphylla Pursh, Fl. Am. Sept. : 466. 1814.

Woody throughout; usually 3-4 dm. high; leaflets green and shining above; pod glabrous; calyx lobes rarely as long as tube.

On prairies, uncommon.

3. *A. fruticosa* L. Sp. Pl. 713. 1753.

Typical *A. fruticosa* (var. *vulgaris* Pursh) is an eastern plant rarely occurring west of the Mississippi. Fassett (Rhodora 38:191. 1936) says the most reliable distinction between this and the var. *angustifolia* given below seems to be in the nature of the pubescence, not in the breadth of the leaflets. The Iowa specimens examined are believed to be the var. *angustifolia* Pursh.

4. *A. fruticosa* var. *angustifolia* Pursh, Fl. Am. Sept. 466. 1814.

A. angustifolia (Pursh) F. Boynton: Biltmore Bot. Studies 1:139. 1902.

A. fragrans Sweet, Brit. Fl. Gard., pl. 241. 1828.

This western phase of the species, according to Fassett (l.c.), occurs e. of the Mississippi only in Wisc. and Ill. Deam, however, lists it for four counties in Indiana. (Fl. Ind. p. 598, 1940). With few exceptions the leaflets of specimens examined from 52 Iowa Counties are at least three times as long as broad, though a form with broad leaflets, appressed pubescence and cuneate leaflets bases occasionally occurs.

River bottoms, margins of streams and lakes, generally common throughout the state.

17. DALEA Juss.

1. *D. alopecuroides* Willd. Sp. Pl. 3:1336. 1802.

Parosela alopecuroides (Willd.) Rydb. N. A. Fl. 24:78. 1920.

Parosela Dalea (L.) Britton, Mem. Torr. Bot. Club 5:196. 1894.

Annual, 3-9 dm. tall, glabrous except for the densely villous calyx; leaflets

15-35 or more, elliptical- or linear-oblong, 6-12 mm. long, $1\frac{1}{2}$ -3 mm. wide; flowers in dense cylindrical spikes; bracts ovate-lanceolate, deciduous.

Common on loess bluffs in the Missouri Valley counties and infrequent in dry prairies across the southern part of the state to the southeastern corner.

2. *D. enneandra* Nutt., Fraser's Cat. 1813.

D. laxiflora Pursh, Fl. Am. Sept. 741. 1914.

Parosela enneandra (Nutt.) Britton, Mem. Bot. Club 5:196. 1894.

Perennial, 3-12 dm. tall, glabrous, except for the calyx and its white-plumose lobes; leaflets 7-12, linear or linear-oblong, 4-10 mm. long, 1-2 mm. wide; flowers in very loose spikes, often 12 cm. long; bracts suborbicular; mucronate, conspicuous and persistent.

On loess bluffs, Missouri Valley.

18. PETALOSTEMON Michx.

Corolla pink or purple; calyx silky pubescent.....1. *P. purpureus*

Corolla white; calyx essentially glabrous except on the lobes.

Terminal leaflets 2-9 mm. wide, linear-oblong or elliptic.

Spikes compactly flowered even in fruit; calyx tube essentially glabrous.....

2. *P. candidus*

Spikes loosely flowered, i.e., rachis visible; calyx tube minutely pubescent.....

3. *P. occidentalis*

Terminal leaflets mostly less than 2 mm. wide; spikes globose or short-cylindric,

numerous, often corymbosely arranged4. *P. multiflorus*

1. *P. purpureus* (Vent.) Rydb., Mem. N. Y. Bot. Gard. 1:238. 1900.

Stems branched at base and above, 1-3 ft. high; leaflets 3-5, narrowly linear, clustered, glabrous or sometimes pubescent; flowers rarely white.

A characteristic prairie species, often on sand; more or less common throughout the state, especially westward; specimens seen from 80 Iowa counties.

2. *P. candidus* Michx., Fl. Bor. Am. 2:49. 1803.

Stem 3-8 dm. tall, often branched at the base; leaflets 5-9, 1-4 cm. long, 3-9 mm. wide, oblong-linear, thin; spikes 2-8 cm. long; bracts longer than the calyx, persistent.

Common in the same habitats as in *P. purpureus*; specimens seen from 62 Iowa counties throughout the state.

3. *P. occidentalis* (Gray) Fernald, Rhodora 39:28. 1937.

P. candidus var. *occidentalis* Gray in Sched. Pringle Pl. Mex. no. 1216 and ex. Heller in Britton & Kearney Trans. N. Y. Acad. Sc. 14:33. Oct., 1894.

P. oligophyllus (Torr.) Rydb., Mem. N. Y. Bot. Gard. 1:237. 1900.

Leaflets rather firm, linear to elliptic, terminal one 2-4 mm. wide; spike cylindric, often quite long, becoming rather loosely flowered.

Rare, on prairies, western part of the state; specimens seen from Harrison, Monona, Plymouth and Woodbury Counties.

4. *P. multiflorus* Nutt. Journ. Phil. Acad. 7:92. 1834.

Stem 3-6 dm. high, corymbosely branched, the branches bearing many sub-

globose or short cylindric spikes; leaflets mostly about 1 mm. wide, densely punctate.

This species seems to be very closely related to *P. occidentalis*, and plants may be found with the extremely narrow leaflets and numerous, corymbosely arranged spikes of *P. multiflorus* but with the spikes quite elongated and loosely flowered.

Rare, on prairies in the western part of the state; specimens seen from Woodbury and Plymouth Counties.

19. TEPHROSIA Pers.

1. *T. virginiana* var. *holosericea* (Nutt.) T. & G., Fl. N.A. 296. 1838.

Cracca holosericea (Nutt.) Britten & Baker in Journ. Bot. 38:15. 1900.

All Iowa specimens examined are of this variety which is separated in current treatments from the typical *T. virginiana* (L.) Pers. by having the upper surface of the leaflets pubescent, the typical form having leaflets glabrous above, even when very young. The var. *holosericea* is usually more copiously pubescent throughout. Fassett (Leguminous Plants of Wisconsin, p. 59-62. 1939) shows that the typical form of the species occurs mainly in the south-eastern part of the range of the species while the more pubescent variety is the northwestern expression.

On prairies and sand in the eastern part of the state.

20. ROBINIA L.

1. *R. Pseudo-Acacia* L. Sp. Pl. 722. 1753.

A large tree with essentially glabrous foliage and branchlets, with woody stipular spines and odd-pinnate leaves; leaflets oval or ovate-oblong; flowers white and showy, in drooping axillary racemes; pods narrow flat, 5-10 cm. long, 1-1.5 cm. wide, glabrous, margined.

Cultivated and commonly established in the eastern part of the state; planted westward.

21. ASTRAGALUS (Tourn.) L.

Plants acaulescent or with stem rarely over 1 dm. long; pod one-celled.

Flowers purple; leaflets silky-canescens on both sides, blunt pointed.....

Flowers yellow; leaflets appressed-cinereous, usually greener and less hairy above, rounded or somewhat mucronate at apex.....

Plants with leafy stems, 1 dm. or more long; pods 2-celled (except in *A. distortus*).
Bases of stipules completely or essentially encircling the stem, usually cohering opposite petiole.

Tall, and usually erect; flowers yellow in elongate racemes; pods terete, glabrous.....

Low, diffusely procumbent or ascending; flowers purplish; pod furrowed on back, pubescent.....

Leaflets usually more than 15 mm. long; calyx and pod minutely appressed-pubescent; flowers light purplish.....

Leaflets usually less than 15 mm. long; calyx and pod densely villous; flowers blue-violet.....

Bases of stipules not encircling stem.....

Pod plum shaped, succulent, becoming thick and fleshy.

- Pod 1.5-2.5 cm. long, glabrous; flowers violet-purple; plant appressed-pubescent6. *A. caryocarpus*
 Pod 1-1.5 cm. long, pubescent; flowers yellowish-white, often tinged with purple; plant loosely villous.....7. *A. plattense*
 Pod lance-oblong, strongly lunate, coriaceous, 1-celled, grooved on back; flowers pale purple, in short spikes.....8. *A. distortus*

1. *Astragalus missouriensis* Nutt., Gen. N. Am. Pl. 2:99. 1818.

Xylophacos Rydb. in Small, Fl. S. E. U. S. : 619. 1903.

Tufted; leaflets 11-21, ovate, pointed; stipules lanceolate, 4-8 mm. long, calyx densely strigose, its lobes $\frac{1}{3}$ - $\frac{1}{2}$ as long as tube; pod sessile, round in cross section, appressed-pubescent, transversely wrinkled, sutures keeled.

Dry prairies on loess, etc.; specimens seen from Plymouth and Woodbury Counties.

2. *A. lotiflorus* Hook. Fl. Bor. Am. 1:152. 1833.

Cinereous or hoary with long white hairs; leaflets 7-13, oblong; flowers in heads on peduncles longer than leaves or later ones sessile in axils; calyx lobes about equalling tube; pod pointed at both ends, lunate, ventral suture straight, dorsal curved and grooved, white appressed-pubescent.

Prairies, Mo. Valley.

3. *A. canadensis* L. Sp. Pl. 757. 1753.

A. carolinianus L. Sp. Pl. 757. 1753.

Often 4 ft. high, much branched, glabrate or often quite hairy in prairie habitat; leaflets often 4 cm. long; stipules membranous, cohering, often sheath-like; pod yellowish brown 10-15 mm. long, not including an often elongate, recurved point; calyx lobes $\frac{1}{5}$ - $\frac{1}{3}$ as long as tube.

Common on river banks in sandy soil and on prairies along roadways and railroad tracks; generally distributed throughout the state.

4. *A. adsurgens* Pall. Astrag. 40, pl. 31. 1800.

Specimens seen from Harrison Co. and Osceola Co. seem to be of this species. It is generally larger than *A. hypoglottis*, has light purplish flowers, the calyx and pod finely appressed-pubescent.

5. *A. hypoglottis* L. Mant. 2:274. 1771.

Stem slender, covered with a loose spreading pubescence; leaflets oblong, strigose on both sides, 5-12 mm. long; calyx has black hairs mixed with white as does also *A. caryocarpus*; pod 8-10 mm. long, straight, membranous.

In low prairies.

6. *A. caryocarpus* Ker. Bot. Reg. 2:176. 1816.

Geoprunum crassicaupum (Nutt.) Rydb. in Small, Fl. S. E. U. S. 616. 1903.

Stem much branched at base, prostrate or ascending, 1-6 dm. long, often quite pubescent with appressed hairs; leaflets oblong, often somewhat linear, pale, strigose beneath; stipules much longer than wide; flowers in short racemes; calyx strigose with black and white hairs, tube much longer than lobes.

Prairies, common throughout the central and western parts of state, infrequent in the eastern part of the state.

7. *A. plattensis* Nutt. T. & G. Fl. N. A. 1:332. 1838.

Geoprumnon Rydb. in Small, Fl. S. E. U. S. : 616. 1903.

Specimens without fruits which otherwise appear to be this species were collected by B. Shimek in Harrison and Monona Counties in 1909. It differs from *A. caryocarpus* in being quite villous, with yellowish flowers and much smaller, pubescent pod. It was reported in the check list of the State Horticultural Society in 1907 as uncommon in western Iowa.

8. *Astragalus distortus* T. & G., Fl. N. A. 1:333. 1838.

Holcophacus Rydb., Small, Fl. S. E. U. S. : 618. 1903.

Much branched at base, prostrate or ascending, glabrous or often somewhat appressed-pubescent; leaflets 15-25, obovate, rounded or emarginate at apex; calyx tube twice the length of lobes; pod 1.2-2 cm. long.

In dry soil, mainly in southeastern portion of state.

22. OXYTROPIS DC.

1. *O. Lamberti* Pursh, Fl. Am. Sept. 740. 1814.

Tufted, the very short stems covered with membranaceous, pubescent stipules which are adnate to the base of the petioles; leaves 1-2.5 dm. long; leaflets ascending, linear or linear-lanceolate, 2-5 cm. long, 1-6 mm. wide, with a silky, appressed pubescence; flowers blue-purple, 1.5-2.5 cm. long, in loosely-flowered spikes on peduncles exceeding the leaves; pod sessile, incompletely 2-celled, coriaceous, densely pubescent.

Dry prairies on loess, etc., extreme western part of the state.

23. GLYCYRRHIZA (Tourn.) L.

1. *Glycyrrhiza lepidota* (Nutt.) Pursh, Fl. Am. Sept. :480. 1814.

Perennial herb with odd-pinnate, resinous-dotted leaves; leaflets short-petioled, lanceolate, 2-4 cm. long, mostly acute, paler beneath; stipules lanceolate, early deciduous; flowers whitish, in axillary racemes; calyx lobes longer than the tube; pods oval, with numerous hooked prickles.

Fairly common on prairies and along roadsides mainly in western Iowa; occasionally adventitious eastward.

24. CORONILLA L.

1. *C. varia* L. Sp. Pl. 743. 1753.

A glabrous, branching perennial 3-7 dm. tall, sessile leaves and flowers about 1 cm. long; corolla pinkish, the sharp-pointed, incurved keel purple-tipped.

There are specimens of this weed in the herbarium of Iowa State College from Buena Vista, Lyon, Monona, and Plymouth Counties. It may be established elsewhere in the state in fields, along roadsides, etc.

25. DESMODIUM Desv.

Leaves 3-foliate, leaflets stipellate; pod several jointed, the joints mainly with hooked hairs; flowers all perfect.

Calyx lobes less than $\frac{1}{4}$ as long as the tube; loment not constricted above, deeply constricted below, on a stalk several times the length of the calyx.

Peduncles longer than the stem, arising from the base, leafless (usually); terminal leaflet 1.5-2 times as long as broad, blunt-pointed; pedicels filiform, 1-3 cm. long in fruit. 1. *D. nudiflorum*

Peduncles terminating the leafy stem; terminal leaflet sub-orbicular with a long, acuminate point, pedicels 5-8 mm. long in fruit. 2. *D. acuminatum*

Calyx lobes equalling or exceeding the tube, loment constricted above and below, on a stalk little surpassing the calyx and much shorter than the remnants of the stamen tube.

Hairs on lower surface of leaflets hooked; stipules persistent, ovate-triangular, usually more than 2 mm. wide at base.

Joints of loment rounded below, less than 6 mm. long; leaflets strongly reticulated below; pubescence of rachis mainly glandular; without spreading hairs 1-2 mm. long; leaflets ovate. 3. *D. illinoense*

Joints of loment angled below, 6-12 mm. long; rachis with spreading hairs 1-2 mm. long; leaflets not usually strongly reticulated below; leaflets ovate-lanceolate. 4. *D. canescens*

Hairs on lower leaf surfaces straight, not hooked; stipules usually less than 2 mm. broad at base, triangular-lanceolate or setaceous, deciduous.

Petioles of median leaves shorter than width of leaflets; joints of loment 4-5 mm. long, rounded on lower sides.

Leaflets linear oblong, blunt, thickish, reticulated, almost sessile; flower 4-5 mm. long. 5. *D. sessilifolium*

Leaflets lanceolate-ovate or oblong, only upper leaves subsessile; flowers large, 8-15 mm. long. 6. *D. canadense*

Petioles of median leaves equalling or exceeding width of leaflets; joints of loment rhomboidal.

Leaflets lanceolate-oblong or linear-oblong, averaging less than 1.5 cm. in width. 7. *D. paniculatum*

Leaflets ovate, averaging 2 cm. or more in width.

Stipules broadest above base; flowers 8-12 mm. long; joints of loment 8-12 mm. long, the two lower sides about equal.

Leaflets glabrous beneath; bracts not ciliate. 8. *D. bracteosum*

Leaflets with soft, appressed, white hairs beneath; bracts ciliate. 9. *D. bracteosum* var. *longifolium*

Stipules narrowly lanceolate, broadest at base; flowers 4-7 mm. long; joints of loment 4-8 mm. long, lower sides unequal. 10. *D. Dillenii*

1. *D. nudiflorum* (L.) D. C., Prodr. 2:330. 1825.

Meibomia nudiflora (L.) Kuntze, Rev. Gen. Pl. : 197. 1891.

Leaflets essentially glabrous, quite pale beneath, 3-10 cm. long; stipules 2-4 mm. long, deciduous. A rare form occurs with scattered leaves on the flowering stem.

Infrequent in woods, in eastern Iowa.

2. *D. acuminatum* (Michx.) D. C., Prodr. 2:329. 1825.

D. grandiflorum (Walt.) D. C. of recent American manuals.

Meibomia grandiflora (Walt.) Kuntze, Rev. Gen. Pl. : 196. 1891. See Blake, Bot. Gaz. 78:277. 1924 and Fassett, Rhodora 38:96-97. 1936.

Leaflets with spreading, appressed hairs on both surfaces, 5-15 cm. long, with an acuminate point, 1-3 cm. long; leaves clustered about midway on stem; stipules deciduous, 6-10 mm. long.

Common in woods across the state.

3. *D. illinoense* Gray, Proc. Am. Acad. 8:289. 1870.

Meibomia illinoensis (Gray) Kuntze, Rev. Gen. Pl. : 198. 1891.

Petiole about as long as, or shorter than, the lateral leaflets; leaflets sticky to the touch, sub-coriaceous; pubescence of rachis mainly of jointed, glandular hairs.

4. *D. canescens* (L.) D. C., Prodr. 2:328. 1825.

Meibomia canescens (L.) Kuntze, Rev. Gen. Pl. : 195. 1891

Petioles about as long as the lateral leaflets; leaflets less sticky to touch than *D. illinoense*, usually thinner, plant more branched; long hairs of rachis mixed with both minute and short, hooked hairs.

Dry, open habitats, prairies, etc.; infrequent in southern and central part of state.

5. *D. sessilifolium* T. & G., Fl. N. A. 1:363. 1838.

Meibomia sessilifolia (T. & G.) Kuntze, Rev. Gen. Pl. : 198. 1891.

Stem pubescent with hooked hairs; leaflets green and rough above, hairy beneath, with very short petioles or sessile; loment 1-3 jointed, the segments obliquely ovate, the lower side longer.

One specimen seen by the writer; it was collected in Lee Co. on sand flats s.w. of Ft. Madison by B. Shimek in 1932.

6. *D. canadense* D. C. Prodr. 2:328. 1825.

Meibomia canadensis (L.) Kuntze, Rev. Gen. Pl. 195. 1891.

This species is variable in width of leaflet and amount of pubescence. The character described by Fassett (Leg. Pl. Wisc. 98. 1939) that the amount of pubescence is greatest on the midrib and progressively less copious on the smaller veins seems to be a very dependable one. This character, the narrowly lanceolate and deciduous stipules, the short petioles, the more compact inflorescence, and the absence of hooked hairs on the under surfaces of the leaflets distinguish it quite readily from *D. illinoense*, with which specimens growing in dry open habitats are often confused.

Our commonest species of *Desmodium*, in open woods and on prairies throughout state.

7. *D. paniculatum* (L.) D. C. Prodr. 2:328. 1825.

Meibomia paniculata (L.) Kuntze, Rev. Gen. Pl. 198. 1891.

This species is quite variable in amount of pubescence and width of leaflets, though the typical form is usually described as quite smooth with lanceolate-oblong leaflets. Infrequent in woodlands and openings, eastern part of the state. Specimens collected at Blair Bridge, Harrison Co., by B. Shimek (1909) and Fitzpatrick (1898), are of the type described as var. *pubens* T. & G., having narrow oblong leaflets, pubescent beneath, puberulent stems and loment joints rounded below.

8. *D. bracteosum* (Michx.) D. C. Prodr. 2:329. 1825.

Meibomia bracteosa (Michx.) Kuntze, Rev. Gen. Pl. 195. 1891.

Two specimens seen, one from Jefferson Co., the other from Van Buren Co. The inflorescence has scattered hooked hairs.

9. *D. bracteosum* var. *longifolium* (T. & G.) Robinson, Rhodora 10:29. 1908.

Leaflets thin, usually lighter green beneath; pubescence of under surface of leaflets uniformly distributed; lower sides of loment curving concavely to a conspicuous, rounded point.

In woods and along roadsides, across the state.

10. *D. Dillenii* Darl., Fl. Cestr. 414. 1837.

Meibomia Dillenii (Darl.) Kuntze, Rev. Gen. Pl. 195. 1891.

Often confused with *D. canescens* or with *D. bracteosum* var. *longifolium*, from which the characters given in key above readily distinguish it.

Infrequent in woods in southeastern part of the state.

26. *LESPEDEZA* Michx.

- Stipules and bracts broad, scarious and persistent; calyx lobes broad; annual..... 1. *L. striata*
 Stipules and bracts subulate or setaceous, more or less deciduous; calyx lobes narrow; perennials..... 2. *L. capitata*
 Flowers in dense heads 3. *L. leptostachya*
 Flowers in loose spikes or racemes, or in sessile clusters in the axils.
 Leaflets at least 4 times as long as broad.
 Flowers in elongate, interrupted axillary spikes; corolla yellowish; calyx exceeding the ripe pod; plant silvery pubescent..... 4. *L. virginica*
 Flowers in short, axillary cluster, rarely equalling the subtending leaves; corolla violet-purple; calyx much exceeded by the pod; plant appressed-pubescent but not silvery..... 5. *L. intermedia*
 Leaflets rarely more than 3 times, never 4 times, as long as broad.
 Peduncles not exceeding the petioles of the subtending leaves..... 6. *L. Nuttallii*
 Peduncles much exceeding the petioles of the subtending leaves.
 Flowers in short spikes; calyx lobes 5-6 mm. long; pubescence of stem spreading 7. *L. repens*
 Flowers paniculate on filiform peduncles; calyx lobes 2-4 mm. long; pubescence of stem appressed.
 Plants trailing; cauline leaflets rarely more than 2 cm. long (usually 1-1.5 cm.); stipules usually less than 3 cm. long..... 8. *L. violacea*
 Plants erect or somewhat spreading; cauline leaflets 2-5 cm. long; stipules 3-6 mm. long

1. *L. striata* H. & A., Bot. Beech. Voy. 262. 1841.

This eastern Asiatic species has escaped from cultivation and is known to be established in a few counties of western Iowa. It spreads rapidly in clearings and along thoroughfares.

2. *L. capitata* Michx., Fl. Bor. Am. 2:71. 1803.

Flowers densely capitate on peduncles shorter than the leaves; calyx about 8 mm. long, lobes much exceeding the fruit; flowers cream-colored.

This species is very variable in leaflet shape and type and amount of pubescence. The leaflets may be oblong and obtuse to linear and acute and whitened with a silky pubescence on both sides or glabrous and green above. Pubescence of the stem may be appressed, ascending or spreading, sparse or dense. Many

of these forms have been called varieties and even species. However, in the rather large number of Iowa specimens examined, there seemed to be no satisfactory correlation of pubescence and leaflet shape, and all the variations are treated as a single species with no varieties recognized.

On prairies and in open woods, very common throughout.

3. *L. leptostachya* Engelm. ex. A. Gray, Proc. Am. Acad. 12:57. 1877.

Leaflets 2-4 cm. long, 2-8 mm. wide, green above, silvery-whitened below; peduncles much exceeding the leaves.

A rather uncommon species; on prairies along northern border of the state. Specimens seen from Dickinson, Emmet, Palo Alto, Kossuth, Cerro Gordo and Winneshiek Counties.

4. *L. virginica* (L.) Britton, Trans. N. Y. Acad. Sci. 12:64. 1893.

Stem rarely branched; leaf petioles averaging about 2 cm. long; leaflets 1-5 cm. long, 2-8 cm. wide, thickish, glabrate above, crowded; flowers very numerous toward the summit, scattered below.

In upland prairies and dry open woods, southeastern Iowa. Specimens seen from Decatur, Appanoose, Wapello, Van Buren, Washington, Henry and Lee Counties.

5. *L. intermedia* (Wats.) Britton, Trans. N. Y. Acad. Sci. 12:63. 1893.

L. Stuevei var. *intermedia* Wats. in Gray, Man. Ed. 6:141. 1889.

L. frutescens (L.) Britton, Mem. Torr. Bot. Club 6:205. 1894. (See Blake, *Rhodora* 26:31. 1924).

This species has been reported for Iowa (Greene, 1907); but there are no specimens in the S.U.I. or Iowa State College Herbaria. A few specimens labelled *L. frutescens* or *L. intermedia* in the S.U.I. herbarium proved, in the writer's opinion, to be *L. violacea*.

6. *L. Nuttallii* Darl. Fl. Cest., Ed. 2 :420. 1837.

Plant 6-9 dm. tall; leaflets oval or oblong, glabrous above, appressed-pubescent below, cauline ones often 4 cm. long; flowers 8-25 in each spike.

One specimen from Iowa has been seen by the writer, collected on the Hill Culture Exp. Farm in Davis Co. by Hayden in 1940; probably introduced.

7. *L. repens* (L.) Bart. Prodr. Fl. Phil. 2:77. 1818.

Very finely appressed-pubescent or glabrate; stems usually forming a mat, much branched at base; leaflets oval or obovate; flowers 4-6 mm. long.

Dry sandy soil, southeastern corner of the state. Specimens seen from Monroe, Jefferson, Van Buren, Henry and Lee Counties.

8. *L. violacea* (L.) Pers. Syn. 2:318. 1807.

Stem much branched, the branches spreading or ascending; leaflets oblong-elliptic, thin, pale beneath with an appressed pubescence; flowers 6-10 mm. long, the keel considerably longer than the standard and wings.

Prairies and dry woods, s.e. part of state.

27. VICIA (Tourn.) L.

- Flowers nearly sessile, 1-2 in the axils.....1. *V. sativa*
 Flowers in racemes on well developed peduncles.
 More or less villous-pubescent; racemes dense, 1-sided, 12-many flowered; calyx
 lobes thread-like.....2. *V. villosa*
 Essentially glabrous; racemes loosely 2-8 flowered; calyx lobes, short-triangular.
 Leaflets elliptical or narrowly oblong with numerous, mostly forking veins;
 stipules usually broad, sharply toothed.....3. *V. americana*
 Leaflets narrowly linear 1-3 mm. wide with fewer, ascending, rarely forking
 veins; stipules linear, usually entire.....4. *V. americana* var. *linearis*

1. *V. sativa* L. Sp. Pl. 736. 1753.

Annual, pubescent or glabrate; leaflets oblong, blunt, mucronate 1.5-3.5 cm. long, 4-10 mm. wide; flowers about 2 cm. long; pods essentially glabrous, 4-6 cm. long.

Escaping from cultivation; specimens seen from Clayton, Dubuque, Scott and Winneshiek Counties.

2. *V. villosa* Roth. Tent. Fl. Germ. 2:182.

Often confused with the more northern and probably native *V. Cracca* L. but has flowers at least 5 times as long as wide and long, thread-like calyx lobes contrasted with flowers less than 4 times as long as wide and calyx lobes long-triangular in *V. Cracca*. (See Fassett, *Rhodora* 38:187-189. 1936.)

Escaping from cultivation to roadsides, etc.; specimens seen from Iowa, Johnson, Muscatine and Washington Counties.

3. *V. americana* Muhl. Willd. Sp. Pl. 3:1096. 1802.

Perennial; leaves with 8-14 leaflets, 1-3.5 cm. long, 5-15 mm. wide, varying from firm and veiny to quite thin; lowest leaflets often quite linear and longer than those above; flowers blue-purple, 1.5-2 cm. long.

Alluvial prairies, swamps, etc., common throughout the state, except in the central southern part.

Forms may be found in the western part of the state with narrowly oblong leaflets, approaching the extreme found in the following variety.

4. *V. americana* var. *linearis* Wats. Proc. Am. Acad. 11:134. 1876.

V. sparsifolia Nutt. T. & G. Fl. N. A. 1:270. 1838.

Leaflets 2-5 cm. long, acute or obtuse.

Specimens seen from Harrison, Lyon, Plymouth, Pottawattamie and Woodbury Counties; dry prairies.

28. LATHYRUS (Tourn.) L.

Principal leaves with 8-12 leaflets; plants uniformly more or less pubescent; peduncles with usually more than 8 flowers.....1. *L. venosus* var. *intonsus*
 Principal leaves with 4-6 (rarely 8) leaflets; plants essentially glabrous peduncles
 2-8 flowered.

Leaflets ovate; longest petioles over 2 cm. long; stipules usually more than 1 cm.

broad; flowers yellowish-white; stems not winged.....2. *L. ochroleucus*

Leaflets lanceolate or linear; longest petioles less than 2 cm. long; stipules less
 than 1 cm. broad; flowers purple; stems winged.....3. *L. palustris*

1. *L. venosus* var. *intonsus* Butters and St. John, *Rhodora* 19:158-159. 1917.

Stem 4-angled, not winged 8-15 dm. long, climbing; leaflets elliptic or ovate, 2-7 cm. long, 1-3 cm. wide, with prominent veins; flowers purple.

All Iowa specimens seen are more or less hirtellous throughout, leaflets sometimes only sparsely hairy above, with calyx usually quite wooly, and stipules less than 1.5 cm. long and 5 mm. wide, often quite small.

Somewhat common on prairies in the northern half of the state.

2. *L. ochroleucus* Hook. *Fl. Bor. Am.* 1:159. 1833.

Stems climbing or trailing; 1-8 dm. long; leaflets thin, glaucous beneath not conspicuously veiny; stipules semi-cordate, often $\frac{1}{2}$ as large as the leaflets, rarely quite small.

Infrequent in woods, northern part of the state.

3. *L. palustris* L. *Sp. Pl.* 733. 1753.

Stems winged; leaflets lanceolate or linear, 2-7 cm. long; stipules half-sagittate, entire or somewhat lobed at the base.

This species is very variable in width of leaflets, but with few exceptions, the Iowa specimens seen have leaflets more than 4 times as long as broad.

Infrequent in low prairies, swamps, and along margins of streams and lakes; throughout most of the state.

29. APIOS Medikus

1. *Apios americana* Med., *Vorles. Chrupf. Phys.-oekon. Gesellsch.* 2:355. 1787.

Glycine Apios L. *Sp. Pl.* 753. 1753.

Apios tuberosa Moench, *Meth.* 165. 1794. (See Rehder, *Rhodora* 36:89. 1934).

Stems appressed-pubescent or glabrate; leaflets slightly rough to touch, usually firm but often quite thin, green above, paler beneath, ovate, acuminate 3-10 cm. long; stipules linear, appressed-pubescent, deciduous; flowers, purple-brown, fleshy, standard not appendaged; pod elongate, thick-walled; rootstock moniliform, tubers large.

In woods, low places and margins of streams, ponds, etc., throughout the state.

30. STROPHOSTYLES Ell.

1. *S. helvola* (L.) Britton, *Ill. Fl.* 2:338. 1897.

Leaflets ovate, less than twice as long as broad, usually sinuate-margined or lobed, sometimes nearly regular, sparingly pubescent below; flowers 8-12 mm. long; pod 4-8 cm. long, sparsely strigose; mature seed more than 4 mm. long.

Characteristically in sandy soil along streams, but also along roadsides, in woods and occasionally in prairies; infrequent in the western half of the state, more common eastward.

2. *S. leioperma* (T. & G.) Piper *Contr. U. S. Nat. Herb.* 22:668. 1926.

S. pauciflora (Benth.) S. Wats. *Gray's Man.*, 6th ed., 145. 1890.

Leaflets oblong-lanceolate or linear, never sinuate-margined, slightly pubescent on both sides, 2-5 times as long as broad; flowers 5-6 mm. long; pod

1.5-4 cm. long, closely pubescent; mature seed less than 3 mm. long.

Less frequent than the above species but essentially of same habitat, often collected along railroads; more common in southern half of the state.

31. AMPHICARPA Ell.

Low and twining perennials with aerial, perfect flowers in nodding racemes and cleistogamous, but fertile, flowers in long creeping branches from base or in lower axils.

1. *Amphicarpa bracteata* (L.) Fernald, *Rhodora* 35:276. 1933.

Glycine bracteata L. Sp. Pl. 754. 1753.

C. monoica L. Sp. Pl., ed. 2, 1023. 1763.

A. monoica (L.) Ell. Jour. Acad. Phil. 1:373. 1817.

Falcata comosa (L.) Kuntze as used by Britton and Brown in Ill. Fl. 2:419. 1912.

Typically this species has a slender, sometimes filiform, stem with closely reflexed, whitish or somewhat tawny hairs, often only sparingly hairy; leaflets usually thin, about 4-5 cm. long (2-7), sparingly strigose on both sides, pale beneath; stipules of middle leaves $2\frac{1}{2}$ -4 mm. long, sparsely hairy; flowers pale blue-purple or whitish in few flowered, usually unbranched racemes; calyx tube $3\frac{1}{2}$ -5 mm. long; calyx lobes broadly triangular; floral bracts rounded, about $2\frac{1}{2}$ mm. long, strigose; pod usually glabrous on faces, pubescence on sutures usually appressed upward at least on lower portion of pod.

In woods throughout the state.

2. *Amphicarpa bracteata* var. *comosa* (L.) Fernald, *Rhodora* 39:318. 1937.

Glycine comosa L. Sp. Pl. 754. 1753.

A. pitcheri T. & G. Fl. N. A. 1:292. 1838.

Falcata Pitcheri (T. & G.) Kuntze, Rev. Gen. Pl. 182. 1891.

Typically, this is a much coarser plant than *A. bracteata*, with copious, spreading or reflexed, tawny pubescence and with firmer, larger leaves 5-7 (often 10) cm. long; stipules of middle leaves $4\frac{1}{2}$ -6 mm. long, very hairy; flowers deep blue-purple in 10-many flowered, usually branched inflorescences; calyx lobes lanceolate; calyx tube $4\frac{1}{2}$ -7 mm. long; floral bracts about 3 mm. long, nearly orbicular, canescent; pod strigose, pubescence on basal half of sutures retrorse.

In woods and occasionally in prairies or openings throughout the state.

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The Fresh-Water Algae of Southern United States III, The Desmid Genus *Euastrum*, With Descriptions of Some New Varieties

Gerald W. Prescott and Arthur M. Scott

In 1942 the authors published on the desmid flora of Louisiana and Mississippi and again in 1943 listed the species of *Micrasterias* from those states and Florida and described several new forms. As previously mentioned, the topography, moisture conditions, the chemistry of the soil and the water draining it provide many favorable habitats for desmids in certain sections of the South. The distribution of these plants is of great interest and the authors wish to add to a knowledge of their taxonomy and ecology by treating the various genera individually. A brief diagnosis is given for a species if it has not been described in recent literature.

The authors desire to acknowledge the help of Dr. Hannah Croasdale in preparing the Latin diagnoses. Thanks also are due to Mr. R. K. Salisbury for permission to use unpublished data on some of his Florida collections and for the loan of slides and original sketches from which some of our figures were drawn.

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The symbols (La. 22), (Miss. 31), etc. refer to numbered collections made by the junior author, in which the specimens were found. Duplicates of these collections have been filed in the Farlow Herbarium of Harvard University.

EUASTRUM ABRUPTUM Nordstedt, Pl. 1, Fig. 1

Cells quadrate, the semicells trapezoidal and 3-lobed, the polar lobe short and truncate at the apex, with a shallow, wide, median notch, the lateral angles extended to form a blunt spine; margins of the polar lobe slightly converging to form the side of a widely open sinus between the polar lobe and the extended lateral lobes which are slightly bilobed, the upper lobes more prominent than the lower, the margins of the semicell retuse between the upper and lower lobules which are decorated with two or three blunt spines; the sinus narrow and closed throughout; in apical view quadrate, the poles retuse and with two spine-like processes at each corner, with a slight swelling in the median region on either side, the margin retuse between the polar angles and the median swelling; in side view quadrate-ovate, the poles truncate and straight with the angles tipped with two spines, the lateral margins retuse to a swollen median region which bears two prominent blunt spines; face of the semicell with three prominent granules on a median swelling, a spine within

the margin of the lower basal angles and with two teeth-like spines just within the margin on either side of the apical notch; the wall with two small mucilage pores below and on either side of the apical incision; L. 37.5-41 μ ; W. 27-28 μ ; isth. 7-9 μ . Lac des Allemands, St. Charles Parish, La. (La. 38).

This species shows variations in the numbers of granules (2-4) on the lateral lobes. A feature which is sometimes overlooked and omitted from published drawings is the two mucilage pores which can be seen in the front view of empty cells.

EUASTRUM ABRUPTUM var. *MINOR* West and West, Fla. (Whelden)

EUASTRUM AFFINE Ralfs, Pl. 1, Fig. 2

Semicells 3-lobed, but with a small lateral intermediate lobule; the polar lobe swollen and anvil-shaped, the lateral angles broadly rounded, the apical margin convex and with a deep median notch; lateral margins of the polar lobe converging and then extended laterally to form the shoulder-like intermediate lobule, then deeply emarginate to the lower basal lobes which are slightly bilobed, the lower angles broadly rounded; the sinus narrowly linear, slightly dilated at the extremities; vertical view elliptic, the poles broadly rounded and slightly extended, with four swollen undulations on either side; side view of the semicell rectangular, the pole truncate and the angles broadly rounded, lateral margins sub-parallel and forming a "neck," the lower part of the semicell enlarged with two low swellings on either side; the face of the semicell showing a swelling within the basal lateral lobes and with four in the mid-region, two just above the isthmus and two larger ones just above these; the wall coarsely punctate and with a central mucilage pore; L. 114 μ , W. 63 μ , isth. 19 μ , thickness 29 μ .

In a pond between Ramsay and Folsom, St. Tammany Parish, La., (La. 21); Mississippi (Brown).

Euastrum affine fa. *equilaterale*, fa. nov., Pl. 4, Fig. 2

Semicellulae triangulares, basi latae, basales lobos paululum acclives aut rotundatos et margines non retusos ut in specie gerentes, ad lobum polarem convergentes; lobo polari apicales lobulos prominentes instructo; sinus prorsus lineari atque inaperto; lobulis superioribus lateralibus semicellulae vix productis; superficiei semicellulae protuberationibus tribus prominentibus, una centrali, duabus lateralibus, et regione in media poro mucoso conspicuo praedita; long. 98 μ ; lat. 61 μ ; lat. isthmi 15 μ .

Semicells triangular, broad at the base, with slightly sloping or rounded basal lobes and the margins not retuse as in the typical, converging to the polar lobe which has prominent apical lobules; sinus linear and closed throughout; the upper lateral lobules of the semicell but very slightly produced; face of the semicell with three prominent protuberances, one central and two lateral, and with a conspicuous mucilage pore in the mid-region; L. 98 μ ; W. 61 μ ; isth. 15 μ .

In a ditch 6 miles south of Talisheek, St. Tammany Parish, La. (La. 94).

EUASTRUM AMPULLACEUM Ralfs, fa., Pl. 4, Fig. 6

L. 82 μ ; W. 46 μ ; isth. 15 μ .

Moss Point, Jackson County, Miss. (Miss. 31); ditch 10 miles west of Hickory, St. Tammany Parish, La. (La. 8).

The lobules of the polar lobe are more prominently developed than in the typical forms, so much so as to suggest an approach to *E. affine* Ralfs.

EUASTRUM ANSATUM Ralfs, Pl. 3, Fig. 1

Semicells pyramidal, the apical margin truncate and deeply incised; lateral margins of the polar lobe sub-parallel but diverging to a broad base with the basal angles broadly rounded, the margins slightly undulate as they approach the base; sinus narrowly linear and closed throughout, slightly dilated at the apices; vertical view elliptic with the poles slightly produced and broadly rounded, the lateral margins 3-undulate with a slight median swelling on either side formed by the large protuberance on the face of the semicell; semicell in lateral view elongate-pyramidal with the apex broadly rounded, the upper lateral margins concave and with a large lateral swelling on either side just above the base; face of the semicell with a median protuberance just above the isthmus and two others on either side and above the central zone; wall finely or coarsely punctate; L. 70-90 μ ; W. 32-47 μ ; isth. 12-15 μ .

Ditch at Honey Island, St. Tammany Parish, La.; Florida (Salisbury).

This species shows many different expressions and seems to vary, especially in the proportions of the cell dimensions and in the number and disposition of the facial swellings. The illustration shows a form which varies slightly from the normal.

EUASTRUM ANSATUM Ralfs, fa., Pl. 3, Fig. 2

A form with a central mucilage pore and a medium swelling of the semicell just above the isthmus; membrane coarsely punctate; L. 110 μ ; W. 33 μ . Honey Island, St. Tammany Parish, La.

EUASTRUM ANSATUM var. *DIDELTIFORME* Ducellier, Pl. 3, Fig. 4

L. 73-87 μ ; W. 36-38 μ ; isth. 13 μ ; thickness 26 μ .

Ditch 16 miles north of Alexandria, Rapides Parish, La. (La. 35).

EUASTRUM ANSATUM var. *PYXIDATUM* Delp, Pl. 3, Fig. 3

L. 72 μ ; W. 33 μ ; isth. 5-6 μ .

Mississippi (Prescott and Scott).

EUASTRUM ATTENUATUM Wolle. Florida (Salisbury)

Euastrum attenuatum var. *lithuanicum* fa. *pulchellum*, fa. nov.

Pl. 1, Fig. 3; Pl. 4, Fig. 10

Cellulae circa $1\frac{1}{2}$ -plo longiores quam latae; semicellulis trapezoides, angulis basalibus lateralibus bilobatis, marginibus semicellularum primo divergenti-

bus, deinde profunde emarginatis, lobulis 1-3 granulis ornatis; marginibus superioribus lateralibus profunde concavis, deinde ad apicem angulis rotundatis late truncatam paululum divergentibus; lobo polari circa 12 plicis longitudinalibus atque in superficie apicali admodum super plicas anulo granulorum parvorum ornato; sinu acutissimo sed intus non clauso, extrorsus gradatim aperto; superficie semicellulae habente duas protuberationes medias unam super alteram, atque duas protuberationes laterales, unam in latere prope margines loborum basaliū; long. 51-55 μ ; lat. 33-37 μ ; lat. isthmi 11-12 μ ; crass. 22 μ .

Cells about $1\frac{1}{2}$ times as long as wide; the semicells trapezoidal, the basal lateral angles bilobed, the margins of the semicells diverging at first and then deeply emarginate, the lobules decorated with 1-4 granules; upper lateral margins deeply concave and then diverging slightly to a broadly truncate apex with rounded angles; the polar lobe decorated with about 12 longitudinal folds and a ring of small granules on the apical surface immediately above the folds; the sinus sharply pointed but not closed inwardly, gradually opening outwardly; face of the semicell with two median protuberances, one above the other, and two lateral protuberances, one on either side near the margins of the basal lobes. L. 51-55 μ ; W. 33-37 μ ; isth. 11-12 μ ; thickness 22 μ .

Pond near Ramsay, St. Tammany Parish, La. (La. 21); pond 5 miles west of Bay St. Louis, Hancock County, Miss., (Miss. 22).

This form differs from the typical in the open sinus and the prominence of the longitudinal folds and granules about the apex of the polar lobe; also it is slightly smaller throughout than the typical.

EUASTRUM BIDENTATUM Naegeli, Pl. 1, Fig. 4

Semicell pyramidate, the apical margin broadly convex, the median incision deep and either open or closed, and with the upper lateral angles furnished with a short stout spine; the margins of the semicell bilobulate, the upper smaller than the basal, the margins deeply retuse between the lobules which are tipped with two or three small granules; the sinus narrowly linear throughout, slightly dilated at the extremity; vertical view elliptic with the poles broadly rounded and furnished with 4 teeth, with a large median swelling on either side bearing 3 sharp granules; lateral view of the semicell ovate, the poles broadly rounded and furnished with 3 sharp granules, a large sharp spine-like protuberance just below the poles at either side and a prominent median swelling which is bi-tuberculate; face of the semicell with a median swelling decorated with a varying number of granules, with 3 or 4 granules within the margins of the basal angles, a swelling on either side and just below the apical notch, and with 2 or 3 small granules within the apical margin of the polar lobe on either side of the median incision; L. 51-61 μ ; W. 32-39 μ ; isth. 6.3-11 μ .

Stream near Covington, St. Tammany Parish, La. (La. 22); Mississippi (Brown); Florida (Whelden).

Our specimens as illustrated intergrade with var. *speciosum* (Boldt) Schmidle.

EUASTRUM BIDENTATUM var. *SPECIOSUM* (Boldt) Schmidle, Pl. 8, Fig. 3

L. 38 μ ; W. 23 μ ; isth. 9.5 μ .
Mississippi (Prescott and Scott).

EUASTRUM BINALE (Turp.) Ehrenberg, Pl. 8, Fig. 13

L. 18 μ ; W. 14 μ ; isth. 5.6 μ .
Mississippi (Prescott and Scott).

EUASTRUM BINALE var. *GUTWINSKII* Schmidle, Pl. 1, Fig. 10

L. 24 μ ; W. 17.5 μ ; isth. 4.3 μ .
Stream 3 miles north of Hickory, St. Tammany Parish, La. (La. 96);
Mississippi Prescott and Scott).

EUASTRUM BINALE fa. *HIANS* West, Pl. 8, Fig. 14

L. 11-16 μ ; W. 10-12.5 μ ; isth. 2.5-3.5 μ .
Mississippi (Brown).

EUASTRUM CIASTRONII Raciborski, Pl. 1, Fig. 5, Pl. 8, Fig. 9

Semicells urn-shaped in outline, swollen at the base, the angles broadly rounded; lateral margins retuse to the truncate apices, the upper lateral angles furnished with a short sharp spine, the median incision deep and closed; vertical view elliptic, the poles broadly rounded but furnished with two sharp spines, one on either side of the median line, lateral margins with four sharp protuberances, two in the mid-region more prominent than the others; face of the semicell with a central swelling bearing 4 granules and with a vertical pair of sharp granules just within the margin of the basal lobes opposite a similar pair of granules showing at the margin just above the basal angles; L. 29 μ ; W. 17.5 μ ; isth. 5.5 μ ; zygospore 22-28 μ diam. without spines, spines 8-10 μ long.

Ditch near Rigolets, St. Tammany Parish, La. (La. 84); swamp 13 miles north of Lucedale, George County, Miss., (Miss. 34); 3 miles east of Tarpon Springs, Fla. (Salisbury, unpublished).

Our specimens show less prominent and not so sharply pointed granules as illustrated by West for this species.

Euastrum cornubiense fa. *granulatum*, fa. nov., Pl. 1, Fig. 6

Forma a planta typica granulatione prominenti in undulatione superiore laterali semicellulae atque tuberculo medio magno ad basim admodum super isthmum differt; long. 36 μ ; lat. 25 μ ; crass. cum tuberculo 18 μ ; lat. isthmi 7.5 μ .

A form differing from the typical by its possession of a prominent granulation on the upper lateral undulation of the semicell and a large median tubercle at the base just above the isthmus; L. 36 μ ; W. 25 μ ; isth. 7.5 μ ; thickness including tubercle 18 μ .

Stream near Tylertown, Walthall County, Miss., (Miss. 5).

EUASTRUM CRASSICOLLE Lund. fa., Pl. 1, Fig. 9

L. 27 μ ; W. 14.5 μ ; isth. 4.7 μ ; thickness 9.5 μ .

Semicells in lateral view ovoid with the entire lateral margins and not showing a central protuberance as in the typical.

Ditch 6 miles south of Talisheek, St. Tammany Parish, La. (La. 77).

EUASTRUM CRASSUM (de Bréb.) Kuetzing

Semicells trapezoidal, unequally 3-lobed, the polar lobe broadly cuneate with a convex apical margin with a narrow median incision, the lateral lobules of the polar lobe extended and recurved; a narrow closed sinus between the apical lobules and the upper lateral lobules of the semicell; lateral margins of the semicell retuse to the swollen base, the basal angles but slightly produced; vertical view oblong or ovoid-elliptic, the poles slightly extended and broadly rounded, with three lateral swellings; semicell in side view pyramidal with the apices broadly rounded to truncate, the sides slightly convex to the basal angles which are rectangular; face of the semicell with three large tubercular swellings at the base just above the isthmus, one median and one on either side; cell wall roughly punctate; L. 163-205 μ W. 79-106 μ ; isth. 24-30 μ . Florida (Whelden).

EUASTRUM CRASSUM var. *MICHIGANENSE* Prescott, Pl. 1, Fig. 14

L. 139 μ ; W. 73 μ ; isth. 24 μ . Semicells without central mucilage pore. Ditch 5 miles north of Lacombe, St. Tammany Parish, La. (La. 43).

EUASTRUM CRASSUM var. *MICROCEPHALUM* Krieger, Pl. 1, Fig. 15

Polar lobe relatively small and the upper lateral lobules separated by short sinuses from the apical lobules; with 4 cruciately arranged mucilage pores in the mid-region of the semicell; basal tubercles of the semicell very prominent, the wall at their apices much thickened. L. 134 μ ; W. 66 μ ; isth. 22 μ . Ditch 10 miles west of Hickory, La.; pond 5 miles north of Bonfouca, La.; Sphagnum swamp 2 miles west of Pearl River, all in St. Tammany Parish, La. (La. 8, 58, 61, 71, 76.).

EUASTRUM CRASSUM var. *SCROBICULATUM* Lund. Pl. 1, Fig. 13

L. 137 μ ; W. 70 μ ; isth. 24 μ ; wall coarsely scrobiculate.

Ditch 6 miles northeast of Mandeville, St. Tammany Parish, La. (La. 56); pond 14 miles east of Laurel, Jones County, Miss. (Miss. 37).

EUASTRUM CUSPIDATUM Wolle, Pl. 1, Fig. 8

L. 34 μ including spines; W. 27 μ including spines; isth. 5.6 μ ; thickness 14.5 μ including central protuberance. Ditch 5 miles north of Bonfouca, St. Tammany Parish, La. (La. 59).

EUASTRUM DENTICULATUM (Kirch.) Gay, Pl. 2, Fig. 13

L. 20 μ ; W. 17.5 μ ; isth. 4.6 μ .

Ditch at a swamp 2 miles west of Pearl River, St. Tammany Parish, La. (La. 83).

EUASTRUM DIELTA Ralfs, Pl. 3, Fig. 7

L. 112-120 μ ; W. 61-63 μ ; isth. 15-16 μ . Near Bay St. Louis, Hancock County, Miss. (Miss. 4); Devil's Swamp 2 miles east of Westonia, Hancock County, Miss. (Miss. 20); Florida (Brown).

EUASTRUM DIVARICATUM Lund. Pl. 1, Fig. 7

L. 38 μ ; W. 32 μ including spines; isth. 8 μ ; ditch 10 miles west of Hickory, St. Tammany Parish, La. (La. 8).

EUASTRUM DOLIFORME West and West, Pl. 2, Fig. 12

Cells quadrate; the semicells truncate-pyramideate, the apical margin slightly retuse in the median region, convex on either side and extended into a short, sharp, spine-like process at the lateral angles; margins of the semicells sloping gradually to emarginate rounded basal angles and with a slight undulation about half-way between the upper and lower angles of the semicell; sinus linear, closed throughout but with a slight swelling at the extremities; in vertical view elliptic, the poles narrowly rounded and with a large median swelling on either side; face of the semicell with a large tuberculation in the mid-region just above the isthmus; wall punctate; L. 41 μ ; W. 27 μ ; isth. 10 μ ; thickness 17 μ . Florida (West and West).

EUASTRUM DUBIUM Naegeli, Pl. 2, Fig. 5

Semicells truncate-pyramideate to subquadrate, apex of the polar lobe truncate, with a short narrow incision; lateral margins with two nearly equal rounded lobes, retuse between the lobes; face of the semicell with two granules just within the margin of the polar lobe and one below the apical notch, and with two granules within the lateral margins of the basal lobes, the median region of the semicell with a slightly developed smooth protuberance, the sinus narrow and only slightly swollen inwardly; vertical view quadrate-elliptic, the poles truncate but produced medianly to form a slight swelling, the lateral margins with a low swelling in the median region; lateral view ovate-oblong, the poles sharply rounded, with slight swellings on either side below the poles and with a symmetrical swelling at the base of the semicell, the sinus widely open outwardly; cells small, about $1\frac{1}{2}$ times longer than broad; L. 26.5-33 μ ; W. 19-21 μ ; isth. 4-6 μ . Mississippi (Brown).

EUASTRUM DUBIUM var. *CAMBRENSE* (Turner) West, Pl. 8, Fig. 5

A variety in which the upper lateral lobes are decorated with a short, sharp, upwardly directed spine; the central protuberance with a ring of six granules; L. 32 μ ; W. 20 μ ; isth. 5 μ . Mississippi (Brown).

Euastrum dubium var. *poriferum*, var. nov., Pl. 2, Fig. 6

Varietas lobo polari in apice solummodo emarginato potius quam inciso et poro mucoso centrali in superficie semicellulae praedita; lobulis lateralibus semi-

cellulae duobus tuberculis parvis ornatis; long. 38 μ ; lat. 26 μ ; crass. 17.5 μ ; isth. 9 μ .

A variety with the polar lobe merely emarginate at the apex rather than notched, and with a centrally located mucilage pore in the face of the semicell; lateral lobules of the semicell decorated with two small tubercles; L. 38 μ ; W. 26 μ ; isth. 9 μ ; thickness 17.5 μ . Devils Swamp $2\frac{1}{2}$ miles east of Westonia, Hancock County, Miss. (Miss. 27); ditch 6 miles south of Talisheek, St. Tammany Parish, La. (La. 77).

This variety suggests a "hybrid" with *E. erosum* Lund. W. and G. S. West state explicitly that the species has smooth walls. Our specimens have an apical lobe like *E. erosum* Lund, and wall decorations similar to *E. dubium* Naeg. which has, however, no pore in the face of the semicell.

EUASTRUM ELEGANS (de Bréb.) Kuetzing, Pl. 2, Fig. 7

L. 30 μ ; W. 21 μ ; isth. 5-7 μ . Rare in a ditch 2 miles north of Slidell, St. Tammany Parish, La. (La. 79); ditch 11 miles south of Franklinton, Washington Parish, La. (La. 69); Alabama (Brown).

EUASTRUM ELEGANS var. *COMPACTUM* (Wolle) Krieger, fa., Pl. 2, Fig. 9

A form relatively broader and shorter than in the typical form, with margins of the basal lobes decidedly diverging at first; basal and upper lateral lobules furnished with a sharp granule; the apical notch broad and deep; L. 32.5 μ ; W. 23 μ ; isth. 6.5 μ . Ditch near Goodbee, St. Tammany Parish, La.

EUASTRUM ELEGANS var. *NOVAE-SEMLIAE* Wille, Pl. 2, Fig. 10

Cells larger than in the typical; semicells with basal angles acutely rounded, or slightly truncate; a marginal undulation between the basal angles and the lateral apical angles; L. 36.5-53 μ ; W. 22.5-34 μ ; isth. 3.8-9 μ . Florida (Brown).

EUASTRUM ELEGANS var. *ORNATUM* W. West, Pl. 2, Fig. 8

L. 44 μ ; W. 29 μ ; isth. 8 μ . Ditch 5 miles northwest of Bonfouca, St. Tammany Parish, La.; in Audubon Park, New Orleans, Orleans Parish, Louisiana; pond near Pearl River, St. Tammany Parish, La.; ditch Honey Island, Hancock County, Mississippi. (La. 1, 55); (Miss. 26, 27).

EUASTRUM ELEGANS var. *PSEUDELEGANS* (Turner) West and West
Pl. 2, Fig. 11

A variety with the basal angles of the semicells broadly rounded and seemingly more produced laterally than in the typical plant; the face of the semicell decorated with several low granules and a ring of large granules on the median swelling. L. 40 μ ; W. 25.5 μ ; isth. 7 μ .

Florida (Brown).

EUASTRUM EVOLUTUM (Nordst.) West and West, Pl. 2, Fig. 1

L. 44 μ ; W. 29 μ ; isth. 6.5 μ ; thickness 20 μ .

Rare in a ditch 10 miles east of Pearlington, Hancock County, Miss. (Miss. 42); Florida (Salisbury).

EUASTRUM EVOLUTUM var. *GLAZIOVII* (Borge) West and West
Pl. 2, Fig. 4

L. 55-58.5 μ ; W. 38.5 μ including spines; isth. 10.5 μ .

Pond near Bay St. Louis, Hancock County, Miss.; ditch about 4 miles west of Hickory, St. Tammany Parish, La.; pond near Goodbee, St. Tammany Parish, La. (Miss. 11); (La. 12, 32); Florida (Whelden).

EUASTRUM EVOLUTUM var. *INTEGRUM* West and West, Pl. 2, Figs. 2, 3

L. 27 μ ; W. 35 μ ; isth. 8 μ . In a ditch 1 mile south of Tangipahoa, Tangipahoa Parish, La.; Devil's Swamp 2½ miles east of Westonia, Hancock County, Miss.; ditch 3 miles east of Rigolets, St. Tammany Parish, La.; pond near Westonia, Hancock County, Miss. (La. 17, 84); (Miss. 28).

EUASTRUM GEMMATUM de Brébisson, Pl. 2, Fig. 17

Semicells 3-lobed, the polar lobe short with lateral margins converging downward to form the side of a broad sinus between the polar lobe and the quadrate, bilobed basal lobes; apex of the apical lobe retuse, the upper lateral angles broadly rounding; sinus narrow and closed throughout (opening outwardly in ours); vertical view elliptic with narrowly rounding and slightly produced poles, and with 3 prominent undulations, the margins deeply retuse between the swellings; lateral view of semicell somewhat urn-shaped, the lower part greatly swollen then narrowed to form a neck between the enlarged and bi-lobed apex; wall coarsely granulate; the face of the semicell with a large central protuberance and one just within the margin of the basal lobes. L. 48-70 μ ; W. 38-47 μ ; isth. 12-14 μ . Mississippi (Prescott and Scott, not a new record as previously reported) (Brown); Alabama (Brown); Covington, St. Tammany Parish, La. Florida (Whelden).

Our specimens differ from the typical in the widely open sinus.

EUASTRUM HUMEROSUM Ralfs, Pl. 4, Fig. 7

Semicells pyramidal, 5-lobed, the polar lobe cuneate, the apex broadly truncate with a narrow median notch, lobules sharply rounded, with a widely open sinus between the apical lobules and upper lateral lobules which are sharply rounded; lateral margins retuse between the upper lateral lobules to the emarginate basal lobes; sinus narrow and closed throughout, slightly swollen at the extremities; vertical view broadly ovoid, the poles produced and sharply rounded, with three large swellings on either side; face of the semicell with a large swelling in the median region just above the isthmus, a smaller one within each basal lobe and one at the base of each upper lateral lobule; a

central mucilage pore; cell wall coarsely punctate; L. 110-123 μ ; W. 65-75 μ ; isth. 15.5-22 μ .

Florida (Salisbury).

EUASTRUM HUMEROSUM var. *EVOLUTUM* Krieger (*E. humerosum* fa.

Prescott 1935), Pl. 4, Figs. 8, 9

A variety with apical lobules greatly extended laterally; with a central mucilage pore in the face of the semicell on each side of which is a prominent swelling; with an emarginate prominent lobule within the margin of each basal lobe; sinus narrow and closed throughout its entire length; wall coarsely punctate. L. 108-118 μ ; W. 60-71 μ ; isth. 16-20.5 μ . In a ditch south of road, 8.2 miles east of Pearlinton, Hancock County, Miss.; Devil's Swamp, 2 miles east of Westonia, Hancock County, Miss.; ditch 1 mile east of St. Tammany, St. Tammany Parish, La. (Miss. 3, 20); (La. 76).

EUASTRUM HYPOCHONDRUM Nordstedt, Pl. 8, Fig. 4

Semicells 3-lobed, the polar lobes rectangular and truncate at the apex, with a shallow median depression, the lateral margins sub-parallel and sloping to broadly rounded basal lobes which are much extended laterally, with a low protuberance on the shoulder of the basal lobes; face of the semicell with granules over the basal lobes and with a median swelling decorated with 4 central granules encircled by a ring of smaller granules, a prominent median granule just above the isthmus at the base of the semicell; sinus narrow throughout its length but slightly opened outwardly; vertical view oblong-elliptic, the poles broadly rounded and with a prominent median swelling on either side; side view quadrate-elliptic, the poles broadly truncate with a prominent broadly rounded swelling on either side at the bases of the semicells. L. 50 μ ; W. 58 μ ; isth. 14 μ . Florida (Borge) (Salisbury, unpublished).

EUASTRUM INDICUM Krieger, Pl. 5, Fig. 13

L. 63-66 μ ; W. 31-36 μ ; isth. 10.5 μ . Mississippi (Prescott and Scott).

EUASTRUM INERME (Ralfs) Lund, Pl. 3, Fig. 6

L. 53-54 μ ; W. 29 μ ; isth. 9.5 μ . Ditch in Devil's Swamp, 1 mile east of Westonia, Hancock County, Miss. (Miss. 21); ditch 1 mile east of St. Tammany, St. Tammany Parish, La. (La. 76).

EUASTRUM INSIGNE, Hass. Pl. 8, Fig. 1

L. 119-124 μ ; W. 58 μ ; isth. 13 μ . Florida (Salisbury).

Euastrum insigne var. *lobulatum*, var. nov., Pl. 2, Fig. 16

Varietas lobulos ad basim lobi polaris velut in var. pulchro Krieger gerens; sinu intus angusto, extra autem late aperto; long. 115 μ ; lat. 66 μ ; lat. lobi polaris 31 μ ; isthm. 15 μ .

A variety with lobules at the base of the polar lobe prominent as in var.

pulchrum Krieger; sinus narrow within but widely open outwardly; L. 115 μ ; W. 66 μ ; width of polar lobe 31 μ ; isth. 15 μ . Stream between Covington and Sun, La.; bayou near Lacombe, La.; ditch 1 mile east of St. Tammany, all in St. Tammany Parish, La. (La. 76).

Euastrum insigne var. *lobulatum* fa. *Taylorii*, fa. nov., Pl. 7, Fig. 6

Forma brevior crassiorque quam planta typica, lobis basalibus altis et sub-emarginatis; sinu angusto, intus acutissimo, extra late aperto; long. 89 μ ; lat. 53 μ ; lat. lobi polaris infra apicem 17 μ ; isth. 13 μ .

A form relatively shorter and stouter than the typical, the basal lobes high and slightly emarginate; the sinus narrow and sharply pointed inwardly, becoming widely open outwardly; L. 89 μ ; W. 53 μ ; width of polar lobe below apex 17 μ ; isth. 13 μ . Ditch about 9 miles northwest of Lacombe, St. Tammany Parish, La. (La. 62).

EUASTRUM INSULARE var. *LACUSTRE* (Messik.) Krieger, Pl. 2, Fig. 14

L. 21 μ ; W. 14.5 μ ; width at poles 9.5 μ ; isth. 4.5 μ ; wall coarsely punctate. In ditches west and south of Hickory, St. Tammany Parish, La.; in a ditch 11 miles north of Moss Point, Jackson County, Miss.; borrow pits near Sun, St. Tammany Parish, La. (La. 32); (Miss. 31).

Euastrum insulare var. *silesiacum* fa. *minus*, fa. nov., Pl. 2, Fig. 15

Forma varietati typicae similis sed minor; long. 19 μ ; lat. 14.6 μ ; isthm. 3.5 μ .

A form similar to the variety but smaller; L. 19 μ ; W. 14.6 μ ; isth. 3.5 μ ; in a sphagnum swamp 2 miles west of Pearl River, St. Tammany Parish, La. (La. 71).

EUASTRUM INTERMEDIUM Cleve, Pl. 6, Fig. 7

L. 70 μ ; W. 41 μ ; thickness 26.5 μ ; isth. 11 μ . In a ditch 10 miles west of Hickory, St. Tammany Parish, La., (La. 8). Florida (Whelden). Our specimens are intermediate between the typical and the variety *validum* West and West.

EUASTRUM INTERMEDIUM var. *LONGICOLLE* Borge, Pl. 6, Fig. 8

A variety with the polar lobe more elongate, the lateral margins converging to rather sharply pointed apical lobules; membrane lightly punctate; L. 66 μ ; W. 42 μ ; width of polar lobe at apex 17 μ ; isth. 10 μ ; Pascagoula, Jackson County, Miss.; ditch 4 miles west of Hickory, St. Tammany Parish, La. (La. 32); Florida (Salisbury, unpublished).

EUASTRUM INTERMEDIUM var. *SCROBICULATUM* Schmidle, Pl. 8, Fig. 6

A variety with 2 mucilage pores, one above the other in the median area of

the semicell; wall scrobiculate; L. 66 μ ; W. 37 μ ; width of polar lobe 22 μ ; isth. 13 μ ; Pascagoula, Jackson County, Miss.

EUASTRUM INTERMEDIUM var. *VALIDUM* West and West, Pl. 8, Fig. 7

A variety in which the lobes are broader and the lateral lobules somewhat produced; L. 70 μ ; W. 40 μ ; isth. 8 μ . Florida (West and West).

EUASTRUM LAPPONICUM Schmidle fa., Pl. 3, Fig. 10

L. 36 μ ; W. 35-36 μ with spines; isth. 8.5 μ . Mississippi (Prescott and Scott).

EUASTRUM JOHNSONII var. *NUDUM* Prescott, Pl. 8, Fig. 2

L. 66-68 μ ; W. 45.6-46 μ ; thickness 26.1-27.5 μ ; isth. 10.5 μ .

Near Ponchatoula, Tangipahoa Parish, La. (Prescott).

EUASTRUM LÜTKEMÜLLERI Ducellier, Pl. 3, Fig. 11

L. 20.5 μ ; W. 12.7 μ ; thickness 9.7 μ ; isth. 4.5 μ . In a ditch 11 miles north of Moss Point, Jackson County, Miss. (Miss. 31).

EUASTRUM OBESUM var. *CRASSUM* Prescott and Scott, Pl. 2, Fig. 5

L. 98-103 μ ; W. 56-57 μ ; isth. 14.5-16 μ . Mississippi (Prescott and Scott).

EUASTRUM OBLONGUM (Grev.) Ralfs, Pl. 4, Fig. 1

L. 103-174 μ ; W. 57-85 μ ; isth. 16.5 μ . In a ditch 1 mile east of St. Tammany, St. Tammany Parish, La.; near Honey Island, St. Tammany Parish; La.; near Grenada, Grenada County, Miss. (La. 66, 76); (Miss. 18). Florida (Salisbury).

EUASTRUM OCULATUM Börgeseon, Pl. 8, Fig. 10

Semicells trapezoidal, the polar lobe truncate with sub-parallel lateral margins, the median notch narrowed and closed, the lateral angles extended into a short upwardly directed spine; the basal part of the semicell slightly bilobed with the margins between the lobules retuse, the lobules furnished with two sharply pointed spine-like extensions of the wall; the sinus narrow and closed throughout, slightly swollen at the extremities; face of the semicell with a median swelling surmounted by a small granular swelling on either side, and with a small granule just within the lateral margins of the basal lobe; apical view broadly elliptic, the poles tipped with a short sharp spine, and with a slight median swelling on either side; side view elongate-elliptic, the poles sharply pointed, the lateral margins of the semicell slightly bi-undulate, the median notch in the apex broadly V-shaped, open but narrowly pointed at the apex. L. 56 μ ; W. 32 μ ; isth. 8 μ . Florida (West and West).

EUASTRUM OCULATUM var. *TONSUM* West and West, Pl. 3, Figs. 8, 9

L. 43 μ ; W. 30 μ ; isth. 8 μ .

In a ditch 2 miles south of St. Tammany, St. Tammany Parish, La. (La. 68, 72). Ditch 8 miles east of Pearlinton, Hancock County, Miss. (Miss. 1).

EUASTRUM PECTINATUM var. *BRACHYLOBUM* Wittr., Pl. 5, Fig. 8

L. 34-35 μ ; W. 22-24 μ ; thickness 19 μ ; isth. 8 μ . Stream near Covington, St. Tammany Parish, La.; ditch 7 miles north of Bonfouca, St. Tammany Parish, La.; ditch 1 mile north of St. Tammany Corner, St. Tammany Parish, La.; ditch 2 miles south of Hickory, St. Tammany Parish, La.; borrow-pit at Florenville, St. Tammany Parish, La.; ditch 10 miles east of Pearlinton, Hancock County, Miss.; swamp $\frac{1}{2}$ mile northwest of Leakesville, Greene County, Miss.; (La. 22, 61, 67, 91, 98); (Miss. 24, 38).

EUASTRUM PECTINATUM var. *REDUCTUM* Taylor, fa., Pl. 5, Fig. 7

L. 58 μ ; W. 38 μ ; thickness 25 μ ; isth. 10.5 μ . In a ditch at a swamp 2 miles west of Pearl River, St. Tammany Parish, La. (La. 86). Our specimens have slightly undulate margins of the basal lobes.

EUASTRUM PINNATUM Ralfs, P. 7, Figs. 7-10

L. 93-156 μ ; W. 44-80 μ ; width of polar lobe 31 μ ; isth. 16-20 μ . In a stream near Tylertown, Walthall County, Miss.; in a pond near Bay St. Louis, Hancock County, Miss.; ditch 12 miles east of Leesville, Vernon Parish, La.; and a pond near Sun, St. Tammany Parish, La. (La. 70); (Miss. 5, 11).

Our specimens showed some variation in the relative width of the basal lobes, intergrading with var. *capitatum* Krieger as well as in respect to the form of the apex of the polar lobe. Pl. 7, Fig. 9 illustrates a form very similar to var. *capitatum* Krieger except that it is relatively narrower and possesses a median mucilage pore.

EUASTRUM PLATYCERUM var. *ACUTILOBUM* Borge, fa., Pl. 4, Fig. 11

L. 60 μ ; W. 52 μ ; isth. 12 μ . Near Dunedin Isles, Pinellas County, Florida. (Salisbury, unpublished).

EUASTRUM PULCHELLUM de Brébisson, Pl. 8, Fig. 8

L. 36.5 μ ; W. 26 μ ; thickness 17 μ ; isth. 7 μ . Pond 7 miles east of Pearlinton, Hancock County, Miss. Florida (Whelden).

EUASTRUM SIBIRICUM var. *EXSECTUM* Grönblad, Pl. 1, Fig. 12

L. 21.5 μ ; W. 19.5 μ ; isth. 4 μ . In a ditch 3 miles east of Rigolets, St. Tammany Parish, La. (La. 84). Previously reported from northern Europe.

Euastrum sibiricum var. *reductum*, var. nov., Pl. 1, Fig. 11

Varietas lobum polarem in apice submarginatum gerens; angulis lateralibus loborum basaliu 3 granulis acutis ornatis; angulis lateralibus lobi polaris rotundatis et granulo minuto praeditis; long. 22 μ ; lat. 18 μ ; crass. 13 μ ; isthm. 5 μ .

A variety with the polar lobe slightly emarginate at the apex; lateral angles of the basal lobes decorated with 3 sharp granules; lateral angles of the polar lobe rounded and furnished with a minute granule. L. 22 μ ; W. 18 μ ; thickness 13 μ ; isth. 5 μ . In a ditch 2 miles south of Hickory, St. Tammany

Parish, La. (La. 91). This form differs mostly in the reduction in the size of the spine-like granules at the angles and in the form of the apical margin of the polar lobe.

EUASTRUM SINUOSUM Lenorm. Pl. 5, Fig. 1

Semicells 3-lobed, the polar lobe cuneate and truncate at the apex, with slightly diverging lateral margins, the median apical incision shallow, narrow and closed; lateral lobes emarginate or bilobulate, the lower basal angles broadly rounded and extended laterally more than the upper lobules; the sinus linear and closed throughout, slightly dilated inwardly; face of the semicell with three swellings in a transverse row across the base and with two similar swellings above in the mid-region; vertical view elliptic in outline with the poles narrowly rounded and with three lateral lobes on either side; side view of semicell pyramidal, broadly rounded or truncate at the apex and quadrate in the basal region with the lateral margins retuse between the base and the apex; cell wall punctate, sometimes coarsely so. L. 56-78 μ ; W. 35-46 μ ; isth. 9-15 μ . Mississippi (Brown); (Prescott and Scott).

Euastrum sinuosum var. *dideltoides* fa. *glabrum*, fa. nov., Pl. 5, Fig. 2

Forma sine poro mucoso centrali, membranam crasse punctatam gerens; long. 70 μ ; lat. 38 μ ; lat. lobi polaris 17.5 μ ; isth. 9.5 μ

A form without a central mucilage pore and with the wall coarsely punctate; L. 70 μ ; W. 38 μ ; polar lobe 17.5 μ wide; isth. 9.5 μ . Pond about 6 miles west of Slidell, St. Tammany Parish, La. (La. 24).

EUASTRUM SINUOSUM var. *GANGENSE* (Turner) Krieger, Pl. 5, Fig. 3

L. 67 μ ; W. 36 μ ; thickness 25.5 μ ; isth. 12.5 μ . In a swamp $\frac{1}{2}$ mile northeast of Leakesville, Greene County, Miss. (Miss. 38). The variety approaches *E. didelta* Ralfs with which it should be compared.

EUASTRUM SINUOSUM var. *PARALLELUM* Krieger

L. 44-45 μ ; W. 25-26 μ ; isth. 10 μ . Swamp 2 miles west of Pearl River, St. Tammany Parish, La. (La. 97). Mississippi (Prescott and Scott).

EUASTRUM SINUOSUM var. *REDUCTUM* West and West, fa.

Pl. 5, Figs. 4, 5

L. 45-57 μ ; W. 25-38 μ ; thickness 19-25 μ ; isth. 8.5-14 μ . In a ditch 6 miles south of Talisheek, St. Tammany Parish, La.; also in a ditch 1 mile east of St. Tammany, St. Tammany Parish, La. (La. 76, 77). The many variations which this species shows in the arrangement of pores are not always accompanied by the modifications in cell form shown in the named varieties.

EUASTRUM SINUOSUM var. *SUBJENNERI* West and West, Pl. 5, Fig. 6

A variety with a median vertical row of three pores in the face of the semicell and with 3-4 other pores on either side; smaller than the typical plant. L. 61-70 μ ; W. 38-42.5 μ ; isth. 11-13 μ . In a pond near airfield, Hammond, Tangipahoa Parish, La.; also in a ditch 7 miles northeast of Mandeville, St.

Tammany Parish, La. (La. 52). Ditch about 11 miles north of Moss Point, Jackson County, Miss. (Miss. 31).

EUASTRUM SPINULOSUM Delp. Pl. 2, Fig. 18

L. 57 μ ; W. 54 μ ; width of polar lobe 20 μ ; isth. 13 μ . Pond near Covington, St. Tammany Parish, La.

EUASTRUM SUBHEXALOBUM West and West, Pl. 8, Fig. 11

L. 39-41 μ ; W. 25 μ ; width of polar lobe 13.5-14.5 μ ; isth. 7.5 μ . In a pond 2½ miles west of Slidell, St. Tammany Parish, La. (La. 18, 19).

Euastrum subhexalobum var. *poriferum*, var. nov., Pl. 5, Fig. 10

Varietas magnitudine plantae typicae circa simili, angulis basalibus, autem minus acutis, et in superficie semicellulae porum mucosum centralem gerens; membrana sparse sed aspere scrobiculata; long. 39-42.5 μ ; lat. 24.5-26.5 μ ; isthm. 8.5-9 μ .

A variety about the same size as the typical but with basal angles less sharp and with a median mucilage pore in the face of the semicell; wall sparsely but roughly scrobiculate. L. 39-42.5 μ ; W. 24.5-26.5 μ ; isth. 8.5- μ . Ditch 11 miles south of Franklinton, Washington Parish, La. (La. 68).

EUASTROM SUBLOBATUM de Brébisson, Pl. 5, Fig. 11

Cells rectangular, the semicells quadrate, truncate at the poles but with the apical margin retuse, the upper lateral angles rounded, the lateral margins concave to the basal angles which are broadly rounded; base of the semicells convex, the sinus closed outwardly, dilated inwardly; vertical view elliptic with a median protuberance on either side; lateral view elliptic, the semicells ovate with a broadly rounded apex and a prominent swelling on either side near the base. L. 26-48 μ ; W. 20-39 μ ; W. 20-39 μ ; isth. 5.2-12.5 μ . Florida (Bailey); Louisiana (Brown).

EUASTRUM SUBLOBATUM var. *OBTUSATUM* (Gutw.) Krieger,

Pl. 5, Fig. 12

L. 21 μ ; W. 8 μ ; isth. 3 μ . In a bayou near Lacombe, St. Tammany Parish, La. Previously reported from the East Indies. This species should be compared with *Cosmarium* spp.

EUASTRUM TRIGIBBERUM West and West, Pl. 4, Fig. 12

L. 25-30 μ ; W. 23-26 μ ; isth. 6-7 μ . In a stream near Tylertown, Walthall County, Miss.; in a swamp 2 miles northwest of Leakesville, Greene County, Miss. (Miss. 5, 38).

EUASTRUM VALIDUM West and West, Pl. 5, Fig. 9

L. 25-26 μ ; W. 19 μ ; thickness 12 μ ; isth. 5 μ . In a ditch near a swamp 2 miles west of Pearl River, St. Tammany Parish, La. (La. 71, 80).

EUASTRUM VALIDUM var. *GLABRUM* Krieger, Pl. 8, Fig. 12

L. 25-29 μ ; W. 19-21 μ ; isth. 6-6.5 μ ; semicells with a median mucilage pore and a central tubercle on the base of the semicell. In a pond 4 miles north of Folsom, St. Tammany Parish, La. (La. 20). Pond near Hammond, Tangipahoa, Parish, La. Ditch 11 miles north of Moss Point, Jackson County, Miss. (Miss. 31).

EUASTRUM VENTRICOSUM Lund., Pl. 4, Fig. 3

L. 103-143 μ ; W. 60-87 μ ; isth. 17 μ . In a pond near Pearl River, St. Tammany Parish, La. (La. 91, 95). Florida (Salisbury).

EUASTRUM VENTRICOSUM var. *FLORIDANUM* Turner, Pl. 6, Fig. 10

Semicells quadrate, the apical lobe broadly convex, the median notch narrow and shallow and with the lateral angles not so greatly produced as in the typical plant; the margins of the semicells irregularly bilobed, the upper lobes narrow and separated from the apical lobe by an open but narrow sinus, the margin retuse between the upper lobes and the broadly rounded basal lobes; the sinus narrow and closed throughout its length, scarcely swollen at the apices; face of the semicell with a swelling below and on either side of the apical notch and with two large swellings at the base of the upper lateral lobes; in side view quadrate, the poles broadly convex and with a prominent lobe on either side of the poles and with two prominent lobes on either side at the base of the semicell; wall coarsely granulate. L. 96 μ ; W. 54 μ ; isth. 14 μ . Florida (Turner).

Euastrium ventricosum var. *glabrum*, var. nov., Pl. 4, Fig. 4

Varietas sine poro mucosa centrali protuberationem singulam in basi semicellulae admodum super isthmum gerens; incisione inter lobum polarem et lobulos superiores laterales lata et late rotundata; membrana levi vel subtiliter punctata; long. 154 μ ; lat. 94 μ ; isth. 18 μ .

A variety without a central mucilage pore and with a single protuberance at the base of the semicell just above the isthmus; incision between the polar lobe and the upper lateral lobes wide and broadly rounded; wall smooth or finely punctate; L. 154 μ ; W. 94 μ ; isth. 18 μ . In a ditch 1 mile east of St. Tammany, St. Tammany Parish, La. (La. 76).

Euastrium ventricosum var. *rectangulare*, var. nov., Pl. 4, Fig. 5

Varietas marginibus lobi breviter subparallelis et apice lobi polaris late truncato, superficie semicellulae ad basin 3 protuberationibus prominentibus praedita, una centrali admodum super isthmum atque utrinque una emarginata aut bilobata; membrana scrobiculata; long. 104 μ ; lat. 59 μ ; isth. 16 μ .

A variety with the margins of the basal lobe subparallel for a short distance and with the apex of the polar lobe broadly truncate; face of the semicell with 3 prominent protuberances at the base, one central just above the isthmus and one emarginate or bilobed protuberance on either side; membrane scrobiculate; L. 104 μ ; W. 59 μ ; isth. 16 μ . In a pond 5 miles northwest of St. Tammany,

St. Tammany Parish, La. (L. 64). This variety should be compared with var. *floridanum* Turner.

EUASTRUM VERRUCOSUM Ehrenberg, Pl. 6, Fig. 1

Cells nearly circular in outline, the semicells decidedly 3-lobed, the polar lobe short and deeply retuse at the apex, the lateral angles rounded, the lateral margins converging downwardly to form the sides of a narrow sinus between the upper lobules of the lateral semicell lobes, margins of the semicell retuse to the laterally extended basal lobules which are rather sharply rounded; sinus narrow inwardly and slightly dilated at the extremities, widely open outwardly; vertical view elliptical, the poles extended and narrowly rounded, with prominent swellings on either side; lateral view ovate, the poles broadly rounded and dilated, narrowed to form a neck below and then widening in the basal portion of the semicell where there is a prominent swelling; wall coarsely granular, the face of the semicell with a large, central swelling with a smaller one on either side, the swellings with large granules arranged in concentric circles. L. 93-114 μ ; W. 75-92 μ ; isth. 53-55 μ . Florida (Bailey, Salisbury).

EUASTRUM VERRUCOSUM var. *ALATUM* Wolle, fa., Pl. 6, Fig. 2

L. 87 μ ; W. 73 μ ; isth. 18 μ . In a ditch near Dixie Springs, 4 miles north of Summit, Pike County, Miss. (Miss. 13). Also from Honey Island Swamp near Mitchell's Hammock, St. Tammany Parish, La. (La. 78). The Louisiana plant has the sinus similar to var. *alatum* Wolle but the margin of the semicells and shape of the lateral lobules are like the typical species.

EUASTRUM VERRUCOSUM var. *COARCTATUM* Delp., Pl. 6, Fig. 3

Cells smaller than in the typical; the sinus narrow for a greater part of its length and not opening so widely outwardly; L. 92.5-97 μ ; W. 85-87 μ ; isth. 20-23 μ . Mississippi (Brown).

Euastrium verrucosum var. *Dalbisii*, fa. minus, fa. nov., Pl. 6, Fig. 4

A planta typica solum magnitudine minore atque lobulis lateralibus ad basim lobi polaris minus productis differt; long. 58 μ ; lat. 47 μ ; crass. 28.5 μ ; isthm. 15 μ .

A form differing only in its smaller size and in its possession of less pronounced lateral lobules at the base of the polar lobe. L. 58 μ ; W. 47 μ ; thickness 28.5 μ ; isth. 15 μ . In a ditch near Ansley, Hancock County, Miss. (Miss. 19).

EUASTRUM VERRUCOSUM var. *PLANCTONICUM* West and West,

Pl. 6, Fig. 5

L. 90 μ ; W. 91 μ ; isth. 19.5 μ . Florida (Salisbury).

EUASTRUM VERRUCOSUM var. *REDUCTUM* Nordst. Pl. 6, Fig. 6

Smaller than in the typical and with the upper lateral lobules and lateral lobes of the polar lobe not produced as much as in the typical. L. 80-89 μ ; W. 70-86 μ ; isth. 18.5-22 μ . Louisiana (Brown).

EUASTRUM WOLLEI Lagerheim, Pl. 7, Fig. 1

Semicells triangular, the lateral margins converging from sharply rounded basal lobes to a broadly cuneate and much swollen polar lobe, with a narrow median incision at the apex; lateral view quadrate, broadly truncate at the poles, with a low swelling at the apical margin and with greatly extended lateral lobes, lateral margins retuse between the polar lobe to sharply rounded median swellings, then convex but converging to a deep median incision of the cell so that a widely open sinus is formed; vertical view elliptic, the poles produced and narrowly rounded, with two prominent swellings on either side; face of the semicell with two prominent swellings in a nearly median transverse row; wall scrobiculate. L. 155-180 μ ; W. 102-120 μ ; isth. 21-30 μ . Sanford, Seminole County, Fla. (Salisbury); Florida (Wolle); Alabama (Brown).

Nearly all descriptions of this plant state that the wall is granulate, the granules being especially prominent on the two facial swellings where they are arranged in concentric circles. We have seen hundreds of specimens of the species from New England and Florida, of var. *cuspidatum* Wolle from Louisiana, and of var. *pearlingtonense* Prescott and Scott from Louisiana and Mississippi, all of which are unmistakably scrobiculate, without any trace of granules. The pits are very large and are arranged in a somewhat definite pattern as shown in our figure.

EUASTRUM WOLLEI var. CUSPIDATUM Wolle, Pl. 7, Fig. 2

Length about the same as in the species; width considerably greater, resulting in a pronounced attenuation of the lateral lobes, which are produced to form sharp angles; sinus closed within, widely open outwardly; lower margins of lateral lobes markedly convex, upper lateral margins almost straight or very slightly recurved; two prominent sub-hemispherical swellings on the face of each semicell; cell wall thick, especially at angles; entire surface, except small areas at the poles and at the isthmus, covered with large scrobiculations, most of which have a minute pore in the center; in vertical view narrowly rhomboidal, with two prominent protuberances on either side, polar lobe divided into four lobules. L. 160-169 μ ; W. 130-142 μ ; width polar lobe 59 μ ; width of neck 38-40 μ ; thickness 70 μ ; isth. 29-30 μ .

Irénée-Marie (1942) includes this variety in a list (without illustrations or dimensions) of desmids from the vicinity of Lake St. John, Que., and refers to an unnamed variety of *E. Wollei* from Newfoundland described and figured by W. R. Taylor (1935). Taylor's plant, however, is not var. *cuspidatum*, but seems to be simply a large form of the species.

We believe ours is the only other record of the variety since Wolle (1892) reported it from a single station, a sphagnum bed in a pond near Newfield, N. J., and named it var. *cuspidatum* because of its unusual shape and proportions. Wolle's figure is incomplete and the description inadequate, but our plants are recognizably the same as his. Krieger (1937) does not admit this variety, considering it synonymous with the species. It seems likely, however,

that Krieger did not see any specimens, but based his opinion on the unsatisfactory description and figure published by Wolle. We believe the plant is well entitled to varietal rank because of the much greater width and the pointed lateral lobes; accordingly we retain Wolle's designation.

Plentiful in a hand-thrown tow-net collection made by L. A. Whitford in a borrow-pit at Florenville, St. Tammany Parish, La., entangled in filamentous desmids and other algae, also apparently free-floating in plankton. Scott also obtained it in filamentous material growing on the bottom of the same habitat.

EUASTRUM WOLLEI var. *PEARLINGTONENSE* Prescott and Scott,

Pl. 7, Figs. 3, 4, 5

L. 115-128 μ ; W. 73-85 μ ; thickness 42 μ ; isth. 15-27 μ . In a pond near Talisheek, St. Tammany Parish, La. (La. 95); pond 9 miles southeast of Picayune, Pearl River County, Miss.; ditch 8 miles east of Pearlington, Hancock County, Miss. (Miss. 1, 44).

DEPARTMENT OF BIOLOGY,
ALBION COLLEGE,
ALBION, MICH.

AND
NEW ORLEANS ACADEMY OF SCIENCES,
NEW ORLEANS, LA.

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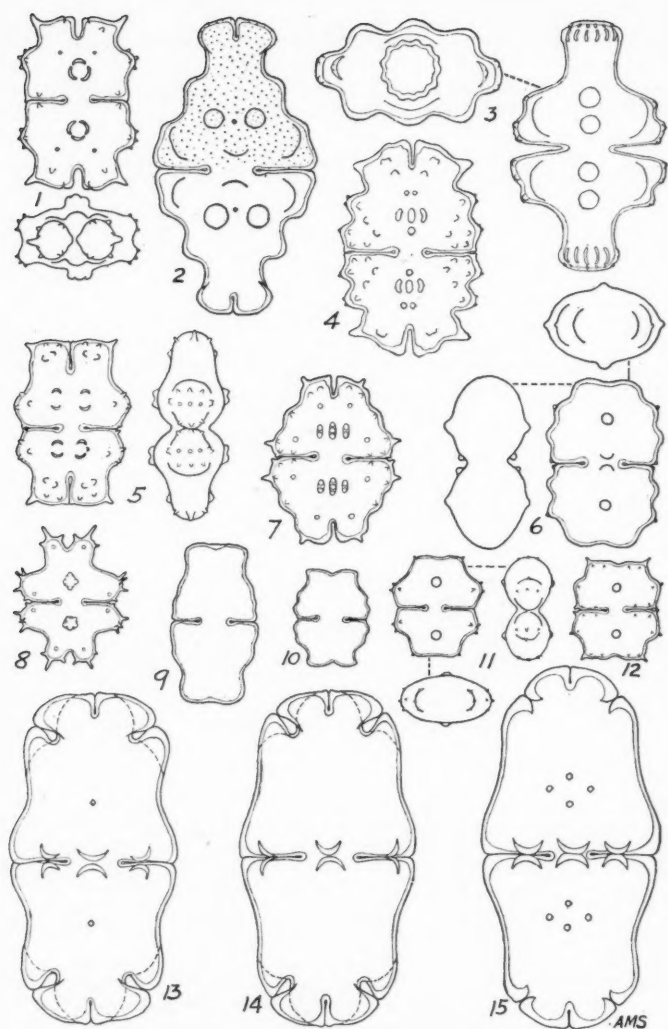


PLATE 1. Figs. 1-15.—1, *Euastrum abruptum* Nordstedt. 2, *E. affine* Ralfs. 3, *E. attenuatum* var. *lithuanicum*, fa. *pulchellum*, fa. nov. 4, *E. bidentatum* Naegeli. 5, *E. Ciastonii* Raciborski. 6, *E. cornubiense*, fa. *granulatum*, fa. nov. 7, *E. divaricatum* Lund. 8, *E. cuspidatum* Wolle. 9, *E. crassicolle* Lund, fa. 10, *E. binale* var. *Gutwinski* Schm. 11, *E. sibiricum* var. *reductum*, var. nov. 12, *E. sibiricum* var. *exsectum* Grönblad. 13, *E. crassum* var. *scrobiculatum* Lund. 14, *E. crassum* var. *michiganense* Prescott. 15, *E. crassum* var. *microcephalum* Krieger.

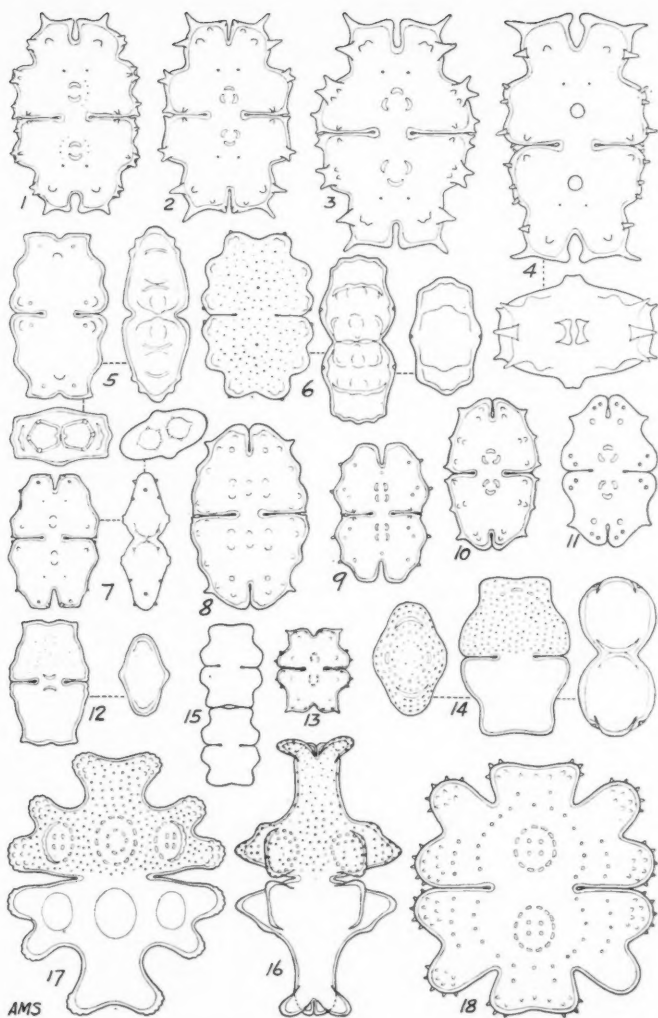


PLATE 2. Figs. 1-18.—1, *Euastrum evolutum* (Nordst.) West and West. 2 & 3, *E. evolutum* var. *integrum* West and West. 4, *E. evolutum* var. *Glaziovii* (Borge) West and West. 5, *E. dubium* Naegeli (after West). 6, *E. dubium* var. *poriferum*, var. nov. 7, *E. elegans* (de Bréb.) Kuetzing. 8, *E. elegans* var. *ornatum*, W. West. 9, *E. elegans* var. *compactum* (Wolle) Krieger, fa. 10, *E. elegans* var. *novae-semiae* Wille (after West). 11, *E. elegans* var. *pseudoelegans* (Turner) West and West (after West). 12, *E. doliforme* West and West (after West). 13, *E. denticulatum* (Kirch.) Gay. 14, *E. insulare* var. *lacustre* (Messik.) Krieger. 15, *E. insulare* var. *silesiacum* fa. *minus*, fa. nov. 16, *E. insigne* var. *lobulatum*, var. nov. 17, *E. gemmatum* de Brébisson. 18, *E. spinulosum* Delp.

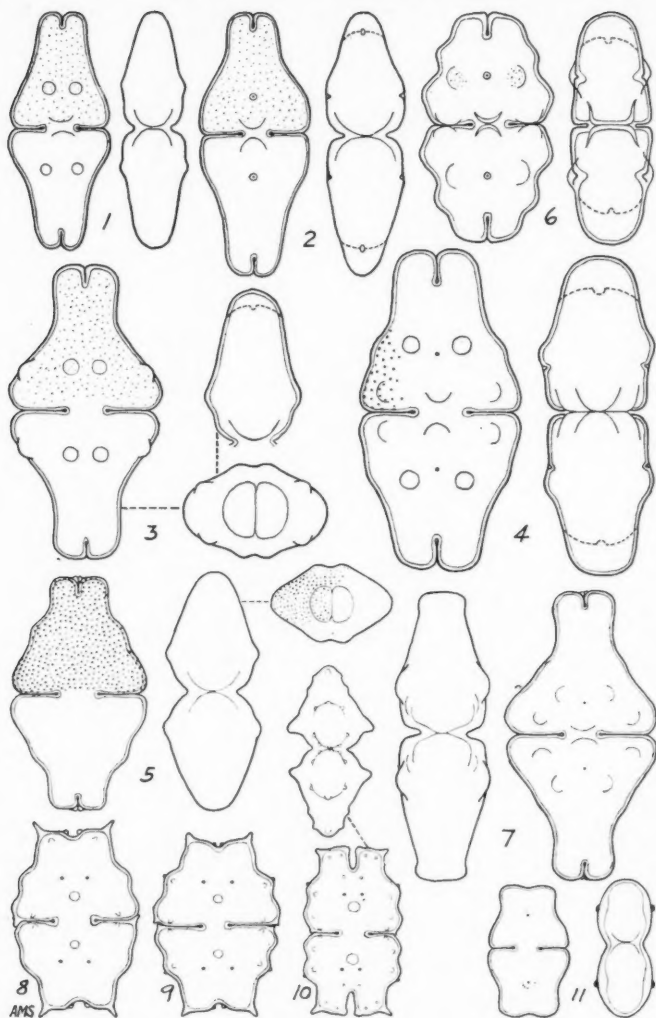


PLATE 3. Figs. 1-11: 1, *Euastrium ansatum* Ralfs. 2, *E. ansatum* Ralfs, fa. 3, *E. ansatum* var. *pyxidatum* Delp. 4, *E. ansatum* var. *dideltiforme* Ducellier. 5, *E. obesum* var. *crassum* Prescott and Scott. 6, *E. inerme* (Ralfs) Lund. 7, *E. didelta* Ralfs. 8 & 9, *E. oculatum* var. *tonsum* West and West. 10, *E. lapponicum* Schm., fa. 11, *E. Lütkenmülleri* Ducellier.

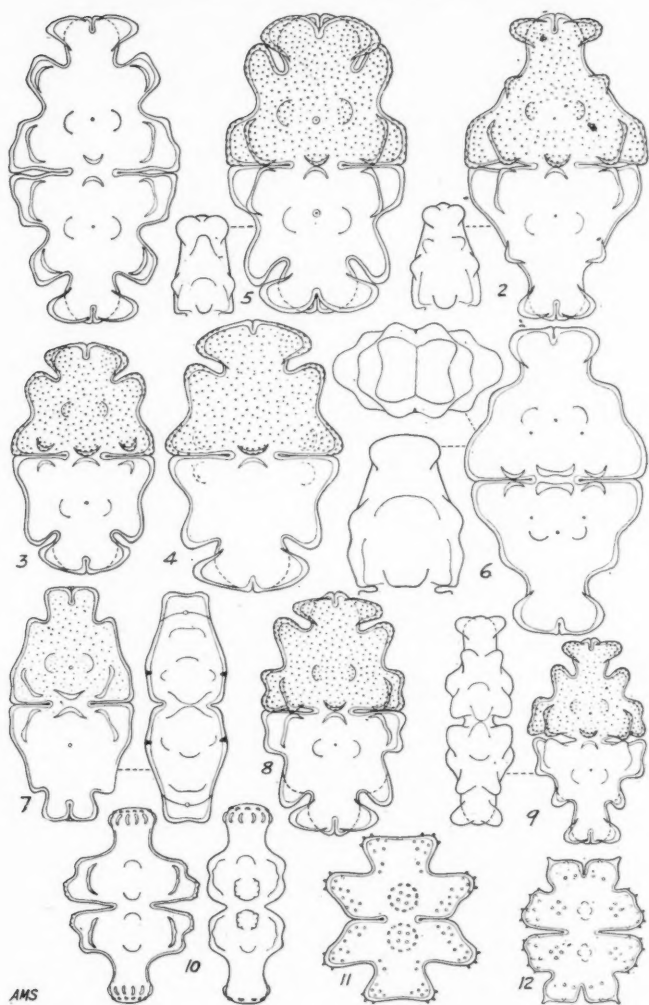


PLATE 4, Figs 1-12: 1, *E. oblongum* (Grev.) Ralfs. 2, *E. affine*, fa. *equilaterale*, fa. nov. 3, *E. ventricosum* Lund. 4, *E. ventricosum* var. *glabrum*, var. nov. 5, *E. ventricosum* var. *rectangulare*, var. nov. 6, *E. ampullaceum* Ralfs, fa. 7, *E. humerosum* Ralfs. (after Krieger). 8 & 9, *E. humerosum* var. *evolutum* Krieger. 10, *E. attenuatum* var. *lithuanicum* fa. *pulchellum*, fa. nov. 11, *E. platycerum* var. *acutitubum* Borge, fa. (after original sketch by R. K. Salisbury). 12, *E. trigibberum* West and West.

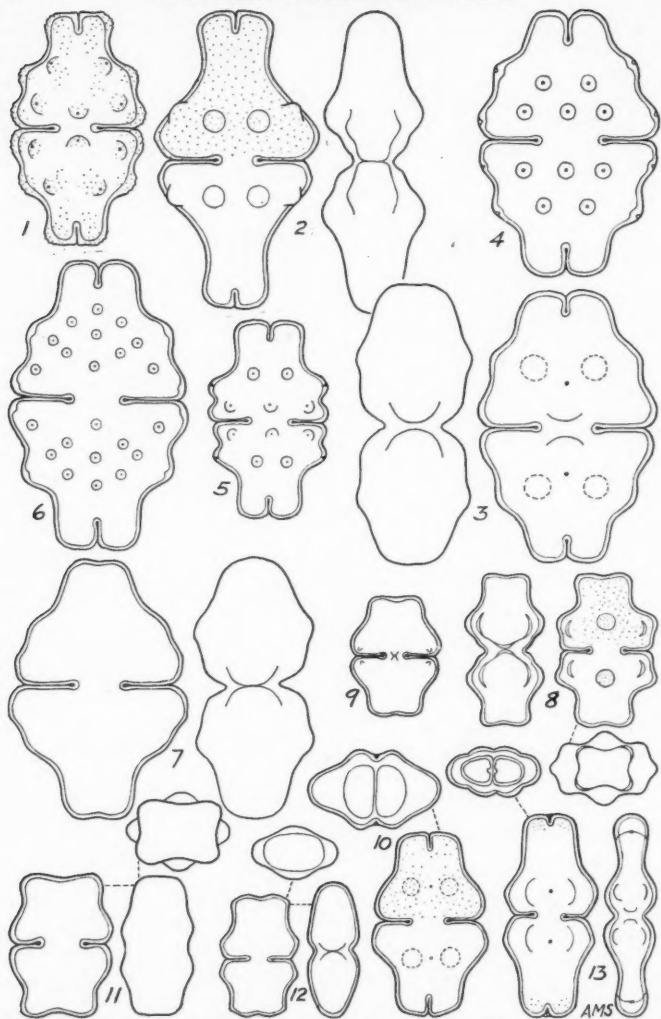


PLATE 5. Figs. 1-13: 1, *Euastrum sinuosum* Lenorm. (after Krieger). 2, *E. sinuosum* var. *dideltoides* fa. *glabrum*, fa. nov. 3, *E. sinuosum* var. *gangense* (Turner) Krieger. 4, *E. sinuosum* var. *reductum* West and West. 5, *E. sinuosum* var. *reductum* West and West, fa. 6, *E. sinuosum* var. *subjenneri* West and West. 7, *E. pectinatum* var. *reductum* Taylor, fa. 8, *E. pectinatum* var. *brachylobum* Witt. 9, *E. validum* West and West. 10, *E. subhexalobum* var. *poriferum*, var. nov. 11, *E. sublobatum* de Brébisson. (after Taylor). 12, *E. sublobatum* var. *obtusatum* (Gutw.) Krieger (after Krieger). 13, *E. indicum* Krieger. (after Krieger).

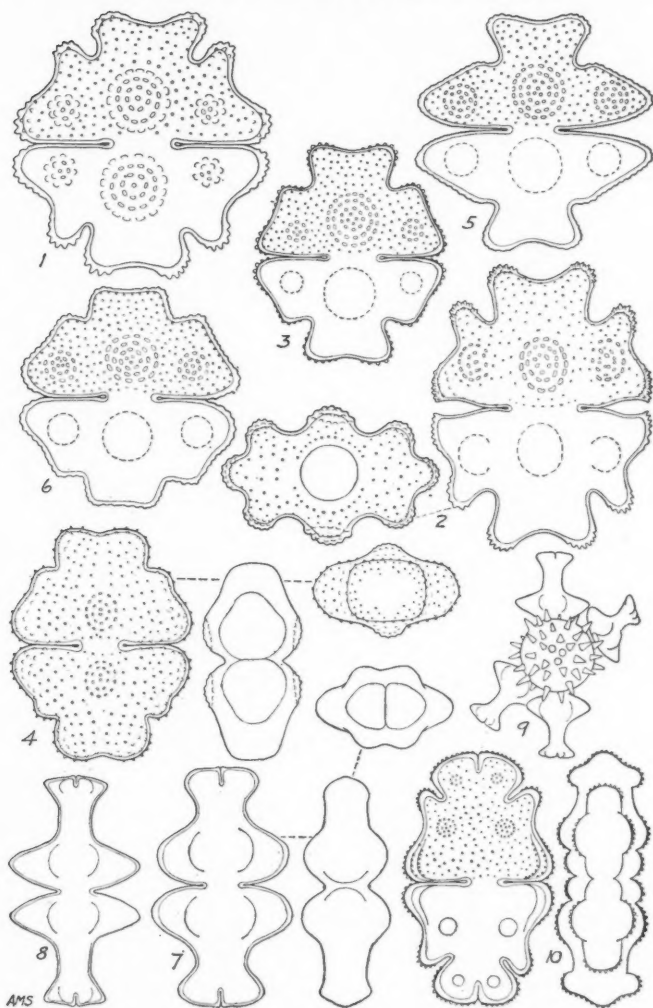


PLATE 6. Figs. 1-10: 1, *Euastrum verrucosum* Ehrenberg. (after Krieger). 2, *E. verrucosum* var. *alatum* Wolle, fa. 3, *E. verrucosum* var. *coarctatum* Delp. (after G. M. Smith). 4, *E. verrucosum* var. *Dalbisi* fa. *minus*, fa. nov. 5, *E. verrucosum* var. *planctonicum* West and West (after West). 6, *E. verrucosum* var. *reductum* Nordst. (after West). 7, *E. intermedium* Cleve. 8, *E. intermedium* var. *longicolle* Borge. 9, *E. intermedium* var. *longicolle* Borge, zygospore (after original sketch by R. K. Salisbury). 10, *E. ventricosum* var. *floridanum* Turner. (after Turner).

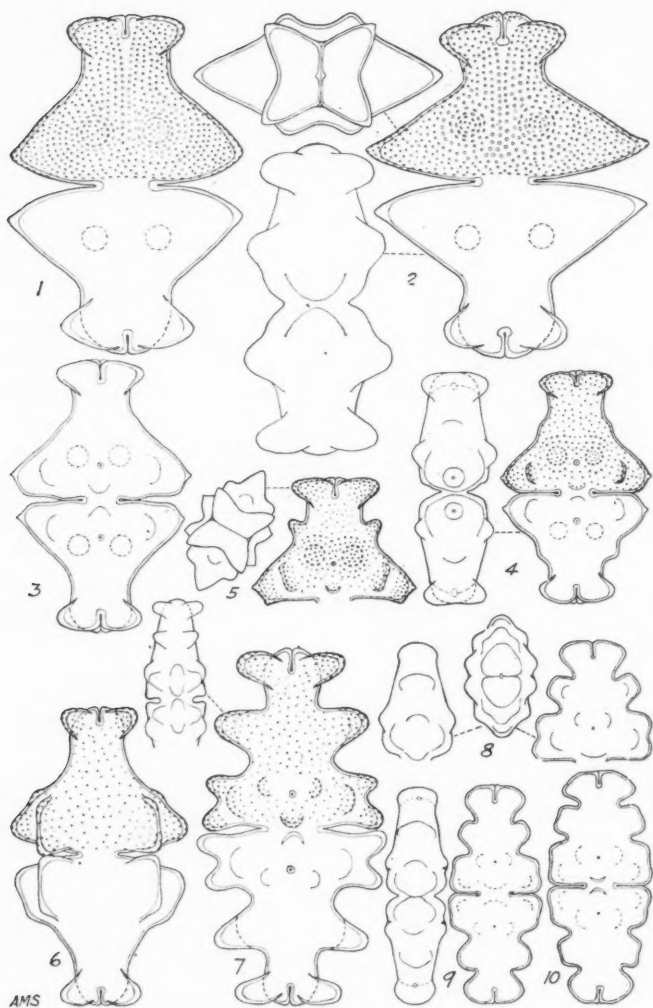


PLATE 7. Figs. 1-10: 1, *Euastrum Wollei* Lagerheim. (Drawn from a Florida specimen on a slide loaned by R. K. Salisbury). 2, *E. Wollei* var. *cuspidatum* Wolle. 3, 4 & 5, *E. Wollei* var. *pearlingtonense* Prescott and Scott. 6, *E. insigne* var. *lobulatum* fa. *Taylorii*, fa. nov. 7, *E. pinnatum* Ralfs. 8, 9 & 10, *E. pinnatum* Ralfs, formae.

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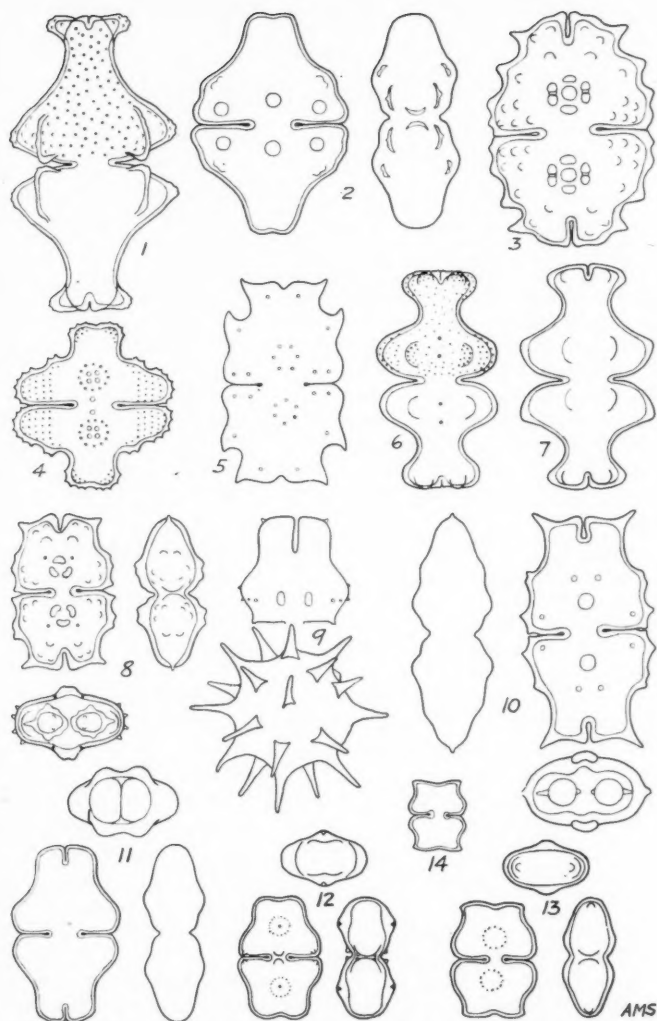


PLATE 8. Figs. 1-14: 1, *Euastrum insigne* Hass. (after Krieger). 2, *E. Johnsonii* var. *nudum* Prescott. 3, *E. bidentatum* var. *speciosum* (Boldt) Schm. (after Krieger). 4, *E. hypochondrum* Nordst. (after Krieger). 5, *E. dubium* var. *cambrense* (Turner) West and West (after West). 6, *E. intermedium* var. *scrobiculatum* Schm. 7, *E. intermedium* var. *validum* West and West (after West). 8, *E. pulchellum* de Brébisson (after Krieger). 9, *E. Ciastonii* Racib., zygospore (after original sketch by R. K. Salisbury). 10, *E. oculatum* Börgesen (after Börgesen). 11, *E. subhexalobum* West and West. 12, *E. validum* var. *glabrum* Krieger. 13, *E. binale* (Turp.) Ehrenberg (after Krieger). 14, *E. binale* fa. *hians* West and West (after Krieger).

Notes on Wisconsin Parasitic Fungi. VII.

H. C. Greene

These notes, unless otherwise specified, are based on collections made in Dane County in the vicinity of Madison during the season of 1944. They represent a continuation of the work of the late J. J. Davis who published extensively on the plant parasitic fungi of Wisconsin.

PHYSODERMA CLAYTONIANA Greene on *Claytonia virginica* has recently been described by me (Farlowia 1:569, 1944). In the type specimen the yellow-brown, globose or subglobose spores were $16-23\ \mu$ diam., and appeared mature. However, L. E. Wehmeyer has sent me a specimen of *Physoderma* on the same host from Ann Arbor, in which the spores run from about $21-30\ \mu$. Spores of comparable size are identical in both specimens, and the effect on the host is similar, but the largest spores in the Michigan material are of a considerably deeper shade of brown. It appears probable that this specimen, collected May 30, is more fully matured than the Wisconsin one, collected on April 30.

PHYLLACTINIA CORYLEA, as it develops on members of the black-oak-red oak group, is characterized by vast numbers of perithecia imbedded in profuse superficial mycelium, as Davis once pointed out (Trans. Wis. Acad. Sci. 19(2):672, 1919). Leaves found bearing the fungus have usually fallen and are brown and dead, but very rarely green leaves on small trees may be observed heavily infected, leaving no doubt as to parasitism. Frequently the leaves of large trees are so completely covered that the perithecia are discharged in a shower, becoming attached to all surrounding vegetation, an invitation to the unwary to list "new hosts" for *Phyllactinia corylea*.

CHILONECTRIA CUCURBITULA (Tode) Sacc. has been found on limbs of dead and dying *Pinus banksiana* at Goodman, Marinette Co., June 2, 1944. Coll. R. H. Gruenhagen. Det. M. P. Backus. This interesting fungus is characterized by the many spored asci, the spores being produced presumably by budding. Active parasitism remains to be demonstrated.

ACANTHOSTIGMA OCCIDENTALE (Ell. & Ev.) Sacc. on *Cirsium discolor* has, in addition to normal perithecia, pycnidia which contain large numbers of cylindrical, hyaline phragmospores about $20 \times 4\ \mu$. Externally the pycnidia are indistinguishable from the perithecia. A stylosporous stage which occurs on *Artemisia ludoviciana* has small *Phyllosticta*-type spores about $5 \times 2\ \mu$.

PHYLLACHORA spp.—Orton in his monographic treatment of the graminicolous species of *Phyllachora* in North America (Mycologia 36:18-53, 1944) lists six species from Wisconsin. These occur on 25 different hosts. The following 3 hosts should be added to the list: *Panicum implicatum* (bearing *Ph. punctum* (Schw.) Orton; *Muhlenbergia cuspidata* and *Muhlenbergia mexicana* with *Ph. vulgata* Theiss. & Syd.).

ROSENSCHELDIA HELIOPSISIDIS (Schw.) Theiss. & Syd.—Mature specimens have been found on overwintered stems of *Helianthus* sp., June 11. Previous Wisconsin collections have been immature. It is interesting that large conidia are found in pycnidia which are scattered among the perithecia and are macroscopically indistinguishable from them (see Farlowia 1:572, 1944). The pycnidia are decidedly fewer in number than the perithecia. Pure cultures, derived from ascospores, were obtained by placing small bits of the stroma on moist filter paper in the wells of deep hanging drop slides and allowing the perithecia to discharge the ascospores upward onto drops of nutrient agar on cover slips. Attempts were made to get matching single spore cultures from conidia by subjecting portions of the stroma to surface sterilization with a standard chlorine disinfectant. After washing, mixed suspensions of conidia and ascospores were streaked out on the surface of plates of clear hard agar with 1/2% glucose. After 36 hours numerous germinated conidia were picked individually onto nutrient agar slants. Eventually all such cultures became contaminated and were discarded. It is of interest, however, that in two-week-old ascospore cultures there were produced on short, closely clustered branches of the mycelium numerous germinable conidia which were morphologically identical with those produced naturally in the stromatal pycnidia.

UROMYCES AMERICANUS Speg.—Davis in his "Parasitic Fungi of Wisconsin," p. 44, states that this species is reported to have been collected in Wisconsin, but that there is no specimen at Madison. This is an erroneous statement for there is a specimen on *Scirpus validus* (Ex Herb. Arthur) in the University Herbarium, collected by E. W. Olive at Madison, June 6, 1907, determined by G. B. Cummins (Mycologia 27:611, 1935) and given to the herbarium by him.

UROMYCES ASCLEPIADIS (Schw.) Cke.—Mixed sori of uredo- and teliospores of this species have been found on *Asclepias syriaca*. The uredo stage of this common rust seems not to have been previously collected in Wisconsin.

GYMNOSPORANGIUM CLAVIPES C. & P.—The aecial stage of this fungus is rather commonly developed on *Amelanchier* in Wisconsin, but not so on *Crataegus*. A very fine caulicolous specimen was collected on *Crataegus* sp. at a station south of Oregon, Dane Co. A single previous collection on fruits of *Crataegus* sp. was made by Davis at Two Rivers, Manitowoc Co., in 1917.

MARASMIUS sp. occurred in scanty development on the culms of living quack grass at Madison. This may be parasitic, but if so there is no evidence of harm to the host.

ASTEROMELLA ASTERICOLA J. J. Davis and similar forms were discussed by me in an earlier publication (Farlowia 1:572, 1944). A specimen tentatively assigned to this series was collected on *Solidago altissima* at Madison, August 28, 1943. Previous specimens have been on *Aster lateriflorus* and *A. ericoides*. As was pointed out these can scarcely be properly placed under *ASTEROMELLA*, since the large, short-cylindrical spores have a median septum. The fungus on *Solidago altissima* is more markedly superficial than is the case with the specimens on *Aster*, and indeed it is questionable whether it is a para-

site. It is closely associated, if not connected with a sclerotial fungus that occurs commonly on *S. altissima*. The latter has been variously placed in *Sclerotium mendax* Sacc. and *Sclerotium colchicus* Woronichin. There does not seem to be in the *Hyalodidyma* a genus parallel to *Asteromella* in which these forms might be placed.

CICINNOBOLUS sp.—A distinctive but so far undetermined species of this genus has been found on *Microsphaera alni* on *Lonicera tatarica*. The pycnidia are subglobose, about $25\text{--}30 \times 35\text{--}40 \mu$, with conspicuous, rigid, robust pedicels, up to 25μ long. The conidia are about $6\text{--}8 \times 3 \mu$. While this is obviously not *C. cesati* DeBary, it has not been possible to determine with assurance whether the species has been previously described. Numerous species with overlapping measurements have been made and it seems practically certain that a study of type material would result in a radical reduction in species numbers on morphological grounds.

ASCOCHYTA NEPETAE J. J. Davis was established on material on *Nepeta cataria* from Schiocton, Outagamia Co., August 1917, and until the present the only specimen in the Wisconsin Herbarium has been the type. However, the fungus has recently been collected on the same host at Madison.

DARLUCA FILUM (Biv.) Cast. has been found on unmixed telia of *Puccinia extensicola* Plowr. on *Carex* sp., adding another to a slowly growing list of telial hosts for this commonly urediniculous parasite.

SEPTORIA LIATRIDIS Ell. & Davis.—In an earlier publication this writer listed *Liatris squarrosa* as a host with the statement that the host concerned was the smooth form of *L. squarrosa*, *Liatris glabrata* of Rydberg (Brittonia 1:98, 1931). L. H. Shinnars of the Milwaukee Public Museum informs me, however, that my host, being the southeastern form, is better regarded as *Liatris compacta* (T. & G.) Rydb. In the University of Wisconsin Arboretum at Madison there are specimens of the glabrous *Liatris compacta* and of hirsute *L. squarrosa*. It is of interest that *L. squarrosa* is completely free of *Septoria* while associated interplanted specimens of *L. compacta* are regularly heavily infected. In addition to this difference, *L. compacta* flowers at least five weeks earlier than *L. squarrosa*. Thus it appears to me that in all probability *Liatris compacta* is a good species and properly set apart from *Liatris squarrosa*.

CERCOSEPTORIA LEPTOSPERMA (Pk.) Petr. is common on *Aralia nudicaulis* in Wisconsin. In the early season development of this fungus the conidia are borne almost sessile on small, more or less olivaceous tubercles which average about 20μ in both height and width. In October 1943 at Madison leaves of this host were collected bearing conspicuous black bodies $100\text{--}200 \mu$ diam. which it was thought might be immature perithecia connected with the *Cercoseptoria*. No conidia of *C. leptosperma* were observed at this time. Leaves were overwintered in cheesecloth bags until June 1944. At this time there were masses of typical *Cercoseptoria* conidia borne on the large black bodies. It seems doubtful that the original tubercles developed to this size, for examination of herbarium specimens shows some which have the large bodies in close connection with ordinary *Cercoseptoria* lesions. This is of course suggestive of

a way in which this fungus may overwinter and infection be renewed in the spring. The conidia are borne in such profusion that splashing raindrops might easily spread them over the low, newly developing shoots of the host.

GLOEOSPORIUM HYDROPHYLLI was described by Dearness and House (N. Y. State Mus. Bull. 188:33, 1916) as a new species on *Hydrophyllum canadense*. It has also been reported on *H. virginianum*. A fungus which may be similar has been found on *H. virginianum* at Madison. It is possible that the Wisconsin specimen represents a mixture, since there is considerable variability in spore size and some of the spores seem to be of an *Ascochyta* type. The acervuli (or pycnidia?) are most inconspicuous in the extensive blackish-gray spots, a feature specified by Dearness and House for their material. The spots are of the large effuse type produced by certain species of *Ascochyta* which leads one to wonder whether perhaps the New York type specimen may not have been immature.

COLLETOTRICHUM SORDIDUM J. J. Davis on *Menispermum canadense*. Madison, October 19, 1943. This agrees with the description in all particulars except spore length, those of this specimen being much shorter than the maximum of 33 μ mentioned by Davis. The setae are strikingly inflated below a basal septum, as indicated for the type, which is the only other collection in the herbarium. Davis indicates that this may possibly be connected with *Gloeosporium sordidum* Speg.

FUSICLADIUM ROBINIAE Shear was collected by Davis in 1936 at Lone Rock, Richland Co., on seedling *Robinia pseudacacia*. On these small, delicate leaves the spots are arid and relatively very large, up to 3 mm. diam. The same fungus, found recently at Arena, Iowa Co., on leaves of mature trees, is on much smaller and less well-defined spots, in this respect being more like Shear's material (Fungi Columbiani 1619).

A peculiar non-fruiting fungus, which is perhaps weakly parasitic, develops rather commonly on *Coreopsis palmata* in the vicinity of Madison. The units are small deep-purplish, sclerotium-like bodies, about 100 μ diam., made up of dark heavy-walled cells. These structures are closely gregarious in rounded clusters, about 1-2 mm. diam., and mostly epiphyllous. Each lobe of an infected leaf may bear several clusters, and most of the leaves on any one stem will show the fungus, so that the net effect is a conspicuous discoloration. Infection is evident early in the season, and there is so far no indication that this is connected directly with the formation of a perfect stage, or that it is one of the "honey dew" fungi.

Additional Hosts

The list which follows is of parasites on hosts not hitherto reported as bearing them, in Wisconsin or elsewhere, so far as known to me.

ERYSPHE CICHORACEARUM DC. on *Acalypha virginica*. October 17; on *Monarda fistulosa*. October 17; on *Solidago ridellii*. October 5.

PHYLLOSTICTA VERBASCICOLA Ell. & Kell. on *Verbascum thapsiforme*. July 1.

ASCOCHYTA COMPOSITARUM J. J. Davis on *Silphium perfoliatum*. Dane Co., Black Earth, August 3, 1943. This species has sporules $15-22 \times 4-6 \mu$ and occurs on large, indefinite brown areas. Associated with the *Ascochyta* is a mature *Mycosphaerella*, but the relation, if any, is unknown, for its presence was not recognized until too late to attempt cultures.

SEPTORIA BETULICOLA on \times *Betula sandbergii*. August 18. The host is abundant in the Lake Wingra marsh at Madison.

SEPTORIA PLANTAGINEA Pass. var. PLANTAGINIS-MAJORIS Sacc. on *Plantago aristata*. Dane Co., Basco, June 25. This occurred usually on plants which also bore *Peronospora alta* Fekl. In many instances the earlier formed leaves are entirely covered with the pycnidia and are dead. This may be conspecific with *Septoria inconspicua* B. & C., at least insofar as that species is represented in North American Fungi (No. 1145—not No. 439 as indicated in Saccardo). The species of *Septoria* on *Plantago* are plainly in need of revision.

SEPTORIA LIATRIDIS Ell. & Davis on *Liatris cylindracea*. August 19.

SEPTORIA FUMOSA Peck on *Solidago ulmifolia*. June 21. As Davis once pointed out, this may be the same thing as *Septoria angularis* Dearn. & Barth., and indeed in the present specimen many of the spots are distinctively and sharply angular.

COLLETOTRICHUM VICIAE Dearn. & Overh. on *Vicia angustifolia* var. *segetalis*. Iowa Co., Ridgeway, July 24, 1943. Some of the setae are considerably longer than the upper limit of 65μ indicated in the description. What relation, if any, this has to *Protocoronospora nigricans* Atk. & Edg. emend Wolf is not known. There are no blackened stromata in this specimen and the conidia are consistently larger than the limit given by Wolf for *P. nigricans*.

RAMULARIA VIRGAUREAE Thum. on *Aster umbellatus*. August 15.

CERCOSPORELLA NIVEA Ell. & Barth. on *Solidago serotina*. August 2.

CLADOSPORIUM ASTERICOLA J. J. Davis on *Solidago ulmifolia*. July 23; on *Solidago nemoralis*, August 26; on *Solidago altissima*, August 26.

HELMINTHOSPORIUM ROSTRATUM Drechsler on *Eragrostis pectinacea*. August 6.

CERCOSPORA PENTSTEMONIS Ell. & Kell. on *Pentstemon digitalis*. September 24.

The following hosts have not been previously recorded in these or Davis' notes as bearing the fungi mentioned in Wisconsin.

PHYTOPHTHORA INFESTANS (Mont.) DeBary occurred on fruits of tomato from the University of Wisconsin farms, Madison. Coll. M. P. Backus, October 1943. While this is common on potato it seems to be only very rarely developed on *L. esculentum* in Wisconsin. It has not been specifically mentioned in these lists before, nor are there any specimens from Wisconsin in the herbarium.

PERONOSPORA ALTA Fekl. on *Plantago aristata*. Dane Co., Basco, June 25.

ERYSIPHE CICHORACEARUM DC. on *Aster azureus*. September 24; on *Aster novae-angliae*. October 5; on *Solidago serotina*, September 1; on *Xanthium italicum*. October 1.

LOPHODERMUM JUNIPERUM (Fr.) DeNot. on *Juniperus virginiana*. August 11. Darker states that there is no evidence that this species is parasitic, but most workers seem to have considered it so.

CINTRACTIA JUNCII (Schw.) Trel. on *Juncus dudleyi*. June 4. Reported on this host from New York state also.

CHRY SOMYXA CASSANDRAE (P. & C.) Tranz. I and CHRY SOMYXA LEDICOLA (Pk.) Lagerh. I occur together on *Picea pungens* from Rhinelander, Oneida Co. Coll. R. H. Gruenhagen, June 9, 1941. Det. G. B. Cummins. The later has sent me similar material, ex Herb. Arthur 49816, which was collected in Wisconsin (no other location given) in July 1941. He states that the two rusts frequently are very damaging to *P. pungens* in areas where the hosts grow in close proximity. Gruenhagen's collection came from ornamental specimen trees growing in a city yard, and he states that infection was so heavy that the trees had a strong orange tinge.

MELAMPORA ABIETI-CAPREARUM Tub. II, III on *Salix longifolia*. September 1, 1943.

COLEOSPORIUM SOLIDAGINIS (Schw.) Thum. II, III on *Solidago juncea*. October 20, 1943.

PHRAGMIDIUM IVESIAE Syd. III on *Potentilla norvegica* var. *hirsuta*. September 26.

PUCCINIA OBTECTA Peck II, III on *Scirpus acutus* (*S. occidentalis* of Gray's Manual, 7th ed.). September 8.

PUCCINIA EXTENSICOLA Plowr. I on *Solidago ulmifolia*. June 21. This host does not seem to have been previously listed, although there are several earlier collections from the state.

PUCCINIA EXTENSICOLA Plowr. II, III on *Carex interior*. July 1.

PUCCINIA ASTERIS Duby on *Aster laevis*. Danes Co., Cross Plains, July 7.

PUCCINIA HIERACII (Schum.) Mart. II, III on *Taraxacum erythrospermum*. May 26, 1943.

PELLICULARIA FILAMENTOSA (Pat.) Rogers occurred in profuse development on the lower portions of plants of *Lepidium campestre*, June 14. Mature basidia and basidiospores were observed and sclerotia were found on the crown of some of the plants. Although it is doubtful that the fungus is more than weakly parasitic in this case, the basal parts of the plants were visibly unfavorably affected. This has also been found on stems of mature plants of *Physalis heterophylla*, but the vigor of the host was not noticeably impaired.

PHYLLOSTICTA GROSSULARIAE Sacc. on *Ribes missouriense* (*R. gracile* of Gray's Manual, 7th ed.). October 5, 1943. This is placed here with some doubt. As treated in Ellis and Everhart's "The North American Phyllostictas" p. 24, this species included varied forms as regards conidial size. Those of the Wisconsin specimen are from $3.5-4 \times 5-7 \mu$ and of a decidedly smoky tint. The pycnidia are about 150μ diam. It is perhaps not far from *Coniothyrium*.

SEPTORIA ALNI Sacc. on *Alnus vulgaris*. September 4. As Davis pointed out, *S. alnifolia* Ell. & Ev. seems doubtfully distinct from *S. alni*. The present specimen corresponds well with European material of *S. alni* on the same host.

SEPTORIA AMPELOPSIDIS Ell. on *Pseodera vitacea*. August 6.

SEPTORIA POLYGONORUM Desm. on *Polygonum coccineum* var. *pratincta*. July 12.

SEPTORIA NABALI B. & C. on *Prenanthes racemosa*. Dane Co., near Sauk City, September 16.

CLADOSPORIUM ASTERICOLA J. J. Davis on *Aster sagittifolius*. August 22.

F. DEPRESSUM var. PLATYSPORA (Ell. & Holw.) Davis.—A fungus collected on *Oxypolis rigidus* in 1942 was with some doubt referred to *Fusicladium depressum* (B. & Br.) Sacc. Similar material, collected in quantity recently, has conidia somewhat smaller, and might be assigned to *Cercospora platyspora* Ell. & Holw. which occurs commonly on *Taenidia integerrima* in Wisconsin. Davis, in his "Parasitic Fungi of Wisconsin", makes *C. platyspora* a variety of *Fusicladium depressum*. In view of the present imperfect state of knowledge of the relationship of these intergrading forms, this is probably the most satisfactory treatment and the 1942 collection has been relabeled as such.

HELMINTHOSPORIUM SATIVUM Pamm., King & Bakke on *Phalaris arundinacea*. Dane Co., near Sauk City, August 27, 1940. Det. Dr. C. L. Lefebvre.

CERCOSPORA MEDICAGINIS Ell. & Ev.—*Medicago sativa* appears to have been omitted from Davis' notes as a host of this fungus in Wisconsin.

Additional Species

Not previously reported in these or Davis' notes as occurring in Wisconsin.

PERONOSPORA MANSHURICA (Naum.) Syd. on *Soja max*. Green Co., Albany, August 29. Coll. and det. by E. E. Honey and F. R. Jones.

HYPOXYLON PRUINATUM (Kl.) Cke. on *Populus tremuloides*. August 20, 1943. Coll. & det. R. H. Gruenhagen. Gruenhagen, who has made a special study of this organism, considers it to be definitely parasitic.

SPHAERELLA ALLICINA (Fr.) Auersw. on *Allium cepa* (cult.). Dane Co., Middleton, July 7. I have not been able to determine whether this has or has not been transferred to *Mycosphaerella*, and hence refrain from doing so for the present. This occurred abundantly in a bed of onions being propagated for

sets. The foliage was mostly dead or dying, but in portions of the leaves which were still green numerous yellow flecks were found filled with mycelium, presumably of the *Mycosphaerella*. In the dead and moribund portions very numerous perithecia with mature asci and ascospores occur. This material compares well with No. 639 of Rabenhorst's *Fungi europaei*, Series II. Both have spores slightly larger than indicated in the description.

MYCOSPHAERELLA DAVISII (Ell. & Ev.) F. R. Jones. Fred R. Jones (*Mycologia* 36:518-525, 1944), studying Wisconsin material, has found the perfect stage of *Cercospora davisii*, Ell. & Ev. which occurs on sweet clover. (Horsfall at one time suggested that on morphological grounds *Cercospora zebrina* Pass. on red clover, *C. medicaginis* Ell. & Ev. on alfalfa and *C. davisii* are identical, and that therefore the earliest name, *C. zebrina*, should be used for all of them. However, inoculation results obtained by Jones suggest the contrary.)

Mycosphaerella calamagrostis sp. nov.

Peritheciis seriatis subcuticularibus, subglobose, ostiolatis, nigris, cellis parenchymaticis, 125-160 μ diam.; ascis numerosis, 50-60 x 12-15 μ , subaequalibus; ascosporis hyalinis, subfusiformibus, in uno latere complanatis, septis mediis, 15-17 x 4.5 μ .

Perithecia subcuticular, seriate, subglobose, ostiolate, black, component cells pseudoparenchymatous, 125-160 μ diam.; asci numerous, 50-60 x 12-15 μ , width nearly equal throughout; ascospores hyaline, subfusiform, flattened on one side, septum median, 15-17 x 4.5 μ .

On growing tips and leaf sheaths of *Calamagrostis canadensis*. Madison, Dane Co., Wis., U. S. A., August 4, 1943.

This occurred on living green plants at the height of the growing season and is believed to be parasitic. According to Saccardo, *Mycosphaerella calamagrostidis* Volk was issued, without diagnosis, in Rehm *Ascom. exsicc.* (1906). The fungus occurred on *Calamagrostis varia* from Switzerland, and is said to differ from *Sphaerella tassiana* DeNot. principally in the shape of the perithecia. The latter has asci and spores much larger than the Madison species and is saprophytic on numerous dead grasses and other monocots. It is difficult to determine with certainty in *M. calamagrostis* that the perithecia are not subepidermal, the usual case with *Mycosphaerella*, but in sections they appear to be merely subcuticular.

LINOSPORA TETRASPORA Thompson was described (*Can. Jour. Res. C* 17: 232-238, 1939) as causing a leaf blight of *Populus tacamahaca* Mill. H. H. Whetzel has kindly called my attention to the fact that Davis in 1930 sent him Wisconsin material of this species on *Populus balsamifera*, under the impression that it might be a *Sclerotium*. The specimens at Cornell were collected at Bailey's Harbor, Door Co., on August 10 and 20, 1929. Search for additional material of the Bailey's Harbor collections failed to reveal any, but three other unidentified specimens of the same fungus on *Populus balsamifera* were found. These were from Fish Creek, Ellison Bay, and Peninsula State

Park, all Door Co. stations, and were collected in 1929. G. E. Thompson has identified these as his species, and has provided the herbarium with a mature specimen. The fungus requires overwintering to effect maturation of the ascigerous stage.

PUCINIA CHRYSANTHEMI Roze II on *Chrysanthemum* sp. Langlade Co., Antigo, August 1943. Coll. R. E. Vaughn. Det. R. H. Gruenhagen.

PHYLLOSTICTA POLYGONORUM Sacc. on *Polygonum natans* f. *hartwrightii* (*P. amphibium* var. *hartwrightii* of Gray's Manual, 7th ed.). The spots have a wide, bright red border with a whitish center, and in other respects this corresponds quite closely to the description.

PHYLLOSTICTA ACETOSELLAE Smith & Ramsbottom on *Rumex acetosella*. June 20. A very scanty specimen of this was collected in 1943 and submitted to Tehon, who suggested the identification which the later material confirms.

PHYLLOSTICTA RHAMNI West. on *Rhamnus cathartica*. Waukesha Co., Eagleville, October 3, 1943. It is possible that this is conspecific with *Ph. rhamnigena* Sacc., for Saccardo indicates that the latter differs from *Ph. rhamni* principally in the nature of the spots which are better defined in *Ph. rhamnigena*.

Phyllosticta coreopsidis sp. nov.

Maculis suborbicularibus, parvis, circiter 1-2 mm. diam., brunneis, saepe purpureo-cinctis, frequenter depressis, marginibus elevatis; pycnidiiis fuscis, ostiolatis, subglobosis, variis, ca. 100-250 μ diam., plerumque 100-150 μ ; conidiis hyalinis, elipsoideis, parvis, plerumque 3.5 x 2.5 μ .

Spots suborbicular, small, about 1-2 mm. diam., brown, often with a purplish halo, frequently sunken, with raised margin; pycnidia dark brown, ostiolate, subglobose, variable, 100-250 μ diam. approximately, mostly 100-150 μ ; conidia hyaline, ellipsoid, small, mostly 3.5 x 2.5 μ .

On leaves and stems of *Coreopsis palmata*. Madison, Dane Co., Wis., U. S. A., July 26, 1943.

Many of the finger-like lobes of the leaves show a pronounced curvature, resulting from shrinkage together of the affected tissue. The pycnidia are strongly erumpent and not deeply imbedded in the host tissue. Those on the stems are mostly, but not all, sterile.

PHYLLOSTICTA CIRSII Desm. on *Cirsium vulgare*. August 18. After a good many encounters with small-spored *Phyllostictae* which occur on arid spots on various hosts, I have concluded that the parasitism of many of these is highly doubtful. This matches the description well and has been reported before on the same host, but is here included only as questionably parasitic.

ASCOCHYTA SYRINGAE Bres. on *Syringa vulgaris*. September 18.

STAGONOSPORA CONVULVULI Dearn. & House on *Convolvulus sepium*. July 9. The authors give the spores of this species as 15-18 x 3-4 μ . Some of

the conidia in the present collection are as long as $23\ \mu$, but are then proportionally wider. Dearness and House (N. Y. State Mus. Bull. 188:41, 1915) state "It was thought at first that this might be a variety of *Septoria calystegiae* West., but that has smaller spots and filiform conidia $30\text{--}40 \times 4\text{--}5\ \mu$. The difference between *Septoria* and *Stagonospora* is mainly that of 'filiform' and 'fusoid' as applied to the shape of the conidia. The specimens here considered belong clearly to the latter type and hence to the genus *Stagonospora*." Many of the conidia in the Madison collection are somewhat fusoid, and it definitely suggests *Stagonospora* rather than *Septoria*.

SEPTORIA AGROPYRINA Lobek on *Agropyron repens*. July 11 Det. Roderick Sprague.

Septoria rectae sp. nov.

Maculis sordidis, albidis, marginibus livido-purpureis, rotundatis, parvis, 1-2 mm. diam.; pycnidiis epiphyllis, gregariis, brunneis, globosis, late ostiolatis, parvis, $40\text{--}65\ \mu$ diam.; conidiis hyalinis, filiformibus, continuis, $12\text{--}23 \times 1\text{--}1.5\ \mu$.

Spots sordid whitish with dull purple border, rounded, small, 1-2 mm. diam.; pycnidia epiphyllous, gregarious, brown, globose, widely ostiolate, small, $40\text{--}65\ \mu$ diam.; conidia hyaline, filiform, continuous, $12\text{--}23 \times 1\text{--}1.5\ \mu$.

On leaves of *Potentilla recta*. Madison, Dane Co., Wis., U. S. A., July 7, 1943.

The tiny pycnidia are well imbedded and only slightly erumpent. The ostiole is very wide in relation to the diameter of the pycnidium. A number of species of *Septoria* have been described from North America and Europe on *Potentilla* and closely related Rosaceae, but this species seems to be distinct, although it must be admitted that if inoculation studies were practical the number of species on Rosaceae would probably be found to be fewer than those now set apart.

SEPTORIA ULMARIA Oud. on *Filipendula* sp. October 22, 1943. The leaves are identical with those issued as *Filipendula ulmaria* bearing *S. ulmariae* in Sydow's Mycotheca Germanica No. 2763. The lesions are also very similar. This seems close to *Cylindrosporium* because of the imperfectly developed and lightly colored pycnidia.

SEPTORIA GLYCINES Hemmi on *Soja max*. June 16. Coll. & det. F. R. Jones.

Septoria grindeliicola sp. nov.

Maculis nullis; pycnidiis amphigenis, gregariis vel dispersis, in areis fusco-brunneis saepe tota folia coopertis, $65\text{--}90\ \mu$ diam., subglobosis, brevibus rostratis, fuscis, pachydermis; conidiis hyalinis, plurimum valde curvis, plus minusve distincte 3-5-septatis, $35\text{--}55 \times 1.5\text{--}2\ \mu$.

Spots none; pycnidia amphigenous, gregarious or scattered on dead brown areas, commonly involving the entire leaf, $65\text{--}90\ \mu$ diam., subglobose, short-rostrate, dark, thick-walled, conidia hyaline, usually strongly curved, more or less distinctly 3-5 septate, $35\text{--}55 \times 1.5\text{--}2\ \mu$.

On leaves of *Grindelia squarrosa*. Madison, Dane Co., Wis., U. S. A., September 9, 1943.

Septoria grindeliicola is quite different from *S. grindeliae* Ell. & Barth. which produces small, definite spots, has sporules but slightly curved, continuous or obscurely septate, and thicker at one end.

PHAEOSEPTORIA FESTUCAE var. MUHLENBERGIAE R. Sprague on *Elymus virginicus*, closely associated with *Phyllachora graminis*. July 30. Det. Roderick Sprague. As Sprague states, it is not clear whether the *Phaeoseptoria* is merely associated with the tar spot lesions or is the partial cause of them. He is inclined to doubt that this is an active parasite.

CHALARIA QUERCINA B. W. Henry (Phytopath. 34:631-635, 1944) has been determined as the pathogen causing wilt of various oaks in Wisconsin. Among these are black, red, bur and Hill's oaks. By courtesy of B. W. Henry a dried culture of this organism has been deposited in the University Herbarium, and a slide has been preserved.

CERCOSPORA CHENOPODIICOLA Bres. on *Chenopodium hybridum*. August 10. This has long, slender conidia, very different from those of *Cercospora dubia*, commonly found on the pigweeds. Not previously reported on this host.

CERCOSPORA ACNIDAE Ell. & Ev. on *Acnida tuberculata*. September 1. In this specimen many of the conidiospores are considerably longer than the $35.50\ \mu$ of the description. A new host for this species.

CERCOSPORA RIBIS Earle on *Ribes americanum*. October 20, 1943. Det. Chupp. The scanty specimen was sent in entirely to Professor Chupp and a label with the necessary data has been placed in the herbarium.

CERCOSPORA MACROMACULANS Heald & Wolf on *Syringa vulgaris*. September 18. Det. Chupp.

CERCOSPORA CYNOGLOSSI van Hook on *Lappula virginiana*. September 21. Det. Chupp. Previously reported only on *Cynoglossum*.

CERCOSPORA SALVIICOLA Tharp on a cultivated species of *Salvia*, probably *S. verticillata* L. October 22, 1943. Some of the conidiospores are longer than those of the description, but otherwise correspondence is almost exact.

CERCOSPORA VERBASICOLA Ell. & Ev. on *Verbascum thapsus*. September 27.

Only two species of *Cercospora* have hitherto been reported on *Aster*, according to Chupp. It is therefore of interest that in 1944 two additional species have been found, on *Aster ptarmicoides* and *A. umbellatus*, respectively. Because of the prior application of almost all truly descriptive names in the huge genus *Cercospora*, and to emphasize the paucity of species on *Aster*, Chupp and I have given these the numerical designations of *Cercospora tertia* and *Cercospora quarta*.

Cercospora tertia Chupp & Greene, sp. nov.

Maculis rotundis vel ellipticus, 0.5-2 mm. longis, epiphyllis, marginibus cinereis, centris minutis, brunneis, infra brunneis obscuris; fructificationibus amphigenis; stromatibus subglobosis, fuscis, parvis; fasciis densis compactis; conidiophoris pallidis olivaceo-brunneis; apicibus pallidioribus et angustioribus, rare et obscure septatis, non ramosis, non geniculatis, rectis vel curvis vel undulatis, apicibus anguste rotundatis, $2.4 \times 10-30 \mu$; conidiis subhyalinis vel pallido-olivaceis; cylindraceis, rectis vel leviter curvis, 1-3, plerumque 3-septatis, basibus obconicis, apicibus obtusatis, $2.4 \times 15-40 \mu$.

Spots rounded to elliptic, 0.5-2 mm. long, epiphyllous with a rather prominent gray margin and minute brown center, dull brown on lower surface; fruiting amphigenous; stromata subglobose, dark brown, from a few cells to 30μ diam.; fascicles dense, compact; conidiophores pale olivaceous-brown, paler and more narrow near the tip, sparingly and indistinctly septate, not branched, not geniculate, straight to curved or undulate, tip narrowly rounded, $2.4 \times 10-30 \mu$; conidia subhyaline to pale olivaceous, cylindric, straight to mildly curved, 1-3, mostly 3-septate, base obconic, tip obtuse, $2.4 \times 15-40 \mu$.

On leaves of *Aster ptarmicoides*. Madison, Wis., U. S. A., August 9, 1944. Coll. H. C. Greene.

Cercospora quarta Chupp & Greene, sp. nov.

Maculis nullis; fructificationibus hypophyllis, sparsim effusis, obscure fuligineis, variis; stromatibus nullis, efasciculatis; conidiophoris singulis ex filis procumbentibus erigentibus; pallidis olivaceo-brunneis vel fuligineis; 0.5-septatis, rare geniculatis, irregularibus, curvis vel tortis; apicibus rotundatis vel conicis, $2.5-4 \times 10-60 \mu$; conidiis subhyalinis vel pallidis olivaceis, anguste obclavatis, rectis vel leviter curvis, obscure multiseptatis, basibus truncatis obconicis, apicibus acutis, $2.4 \times 45-150 \mu$.

Spots none, or only an indistinct yellowing of the upper surface; fruiting hypophyllous, scantily effuse, sooty, or sometimes indistinguishable from the dark green leaf surface, in minute patches to large areas; stromata lacking, non-fasciculate; conidiophores arising as single branches from procumbent threads, pale olivaceous brown or fuligineous, 0.5-septate, rarely geniculate, irregular in width, curved to tortuous, tip rounded to conic, $2.5-4 \times 10-60 \mu$; conidia subhyaline to pale olivaceous, narrowly obclavate, straight to mildly curved, indistinctly multiseptate, base obsconically truncate, tip acute, $2.4 \times 45-150 \mu$.

On leaves of *Aster umbellatus*. Madison, Wis., U. S. A., August 15, 1944. Coll. H. C. Greene.

Cercospora partheniphila Chupp & Greene, sp. nov.

Maculis angulatis vel irregularibus, pallide brunneis vel brunneis vel fuscis, interdum marginibus flavidis cinctis; fructificationibus amphigenis; stromatibus plerumque paucis cellulis brunneis compositis; fasciis 2-12 cauliculis divergen-

tibus; conidiophoris pallidis vel mediis brunneis, apicibus leviter pallidioribus, multiseptatis, non ramosis, longissimis 1-3-geniculatis vel aliusmodi tortis; apicibus rotundatis vel subtruncatis, cicatricibus mediis, $3.5 \times 30-250 \mu$; conidiis hyalinis, acicularibus, curvis vel undulatis, obscure multiseptatis, basibus truncatis, apicibus acutis, $2.3.5 \times 40-175 \mu$.

Spots angular to irregular, small to large, sometimes including the entire leaf lobe, varying in shades of brown from pale to almost black, occasionally with a yellow halo; fruiting amphigenous; stromata mostly composed of a few brown cells; fascicles 2-12 spreading stalks; conidiophores pale to medium brown, slightly paler and more narrow toward the tip, multiseptate, not branched, longest ones 1-3-geniculate or otherwise crooked, medium spore scar at the rounded to subtruncate tip, $3.5 \times 30-250 \mu$; conidia hyaline, acicular, curved or undulate, indistinctly multiseptate, base truncate, tip acute, $2.3.5 \times 40-175 \mu$.

On leaves of *Parthenium integrifolium*. Madison, Dane Co., Wis., U. S. A., September 20, 1944. Coll. H. C. Greene.

Chupp also has a specimen of this on *Parthenium hysterophorus*, collected in San Domingo, and sent to him by Chardon.

CERCOSPORA XANTHICOLA Heald & Wolf on *Xanthium italicum*. September 25. In this specimen the conidiophores are somewhat longer and more tortuous than as described, but the lesions and conidia are identical. Previously reported only on *Xanthium canadense*.

MACROSPORIUM SARCINAEFORME Cav. on *Trifolium pratense*. July 28, 1943. This is said to be prevalent throughout the state, but Davis does not mention it in his notes. Plant pathologists do not consider *M. sarcinaeforme* to be a serious parasite, however.

ALTERNARIA ABUTILONIS (Pass.) Schwarze on *Abutilon theophrasti*. September 10, 1943. Coll. R. H. Gruenhagen. D. H. Linder informs me that the crediting of this species to Spegazzini, as commonly appears in the literature, is an error, for in Spegazzini's Dec. Myc. Ital. No. 58 the species is definitely attributed to Passerini. Passerini described this as *Macrosporium abutilonis*, and Schwarze (Parasitic Fungi of New Jersey, p. 126) assigned it to *Alternaria*, making the combination.

UNIVERSITY OF WISCONSIN,
MADISON, WISCONSIN.

Notes and Discussion

Flora of Illinois:¹ A Reply to M. L. Fernald²

George Neville Jones

Having had the temerity to write a book containing keys for identification of the vascular plants in an area the reviewer evidently regards as his private preserve, apparently I have been guilty of lèse-majesté. This is not seemly. We had supposed that the era of "absent treatment" was about over, but the reviewer, undertaking this "unwelcome and highly unpleasant task" (sic) without first-hand knowledge of the area or its flora is forced to fall back largely upon quotations from catalogues published chiefly during the nineteenth century, some of which are now more than one hundred years old. Although Professor Fernald is notorious for his caustic reviews and trenchant criticisms apparently few of his victims have taken his diatribes with sufficient seriousness to consider a reply worth while. In the present instance, however, there are many misleading or quite untruthful statements in the review which must be corrected. Although the reviewer's real objections are largely left to be inferred by the reader, the ostensible objections are principally the omission of "fully 200 species or strongly defined geographical varieties," the omission of numerous binomials mentioned in old catalogues, the alleged oversight of Michaux's "60 new species from Illinois," the following of A. S. Hitchcock instead of M. L. Fernald in the treatment of certain Gramineae, the "specious" simplicity of certain parts of the key to the families, the "incomplete" bibliography, and the practice of uniformly spelling specific and varietal names with an initial small letter.

The introductory account occupying the first two pages of the 15-page sustained philippic presented in the best Fernaldian style contains unfortunately a number of misleading statements, as, for example, that the author of *Fl. Ill.* is unfamiliar with the ancient works and had not studied them or taken them into consideration. Since the principal objective in this book was to present a workable account of the present day flora, not a commentary on numerous previous publications, it was quite unnecessary as well as manifestly impossible to account for every binomial mentioned in these old catalogues. In another place Fernald objects to the bibliography because it contains "scarcely half of the papers or reports upon Illinois plants." This is a massive understatement, for less than five per cent of the titles are cited, and moreover no attempt was made to include more of them. Instead, the reader is referred at the top of page 284 to A. G. Vestal's scholarly³ and comprehensive bibliography of the ecology of Illinois, including more than one thousand titles. There was no point in repeating in a small handbook this 98-page bibliography the first part of which was published as recently as 1934 and is of course readily available to all persons who wish to use it. Yet, on page 208 of the review Fernald says, "Toward the end of the volume there is a brief bibliography in which a part, but scarcely half, of the papers or reports upon Illinois plants are cited." Here is a deliberate avoidance of mentioning the 12-page list of nearly 400 botanical papers by 180 or more botanists, which gives the names of the authors with the titles of their monographs, revisions, etc. dealing with Illinois plants.

Although it is asserted that the author of *Fl. Ill.* has not examined the specimens of the older collectors and their published lists of plants, even a casual examination of the

¹ Flora of Illinois, containing keys for identification of the flowering plants and ferns. American Midland Naturalist, Monograph No. 2, 317 pp. University of Notre Dame, 1945.

² An Incomplete Flora of Illinois. *Rhodora* 47:204-219, 1945.

³ I am following Fernald's naive and rather amusing custom of alluding to papers of which he approves, as "scholarly."

book shows that in the body of the text there are hundreds of citations of actual specimens especially of rare plants by more than 70 different collectors, including Hill, Brendel, Vasey, Moffatt, McDonald, G. D. Fuller, Gleason, Schneek, Hall, V. H. Chase, Pepon, Seymour, Patterson, Agnes Chase, Gates, Babcock, Clinton, French, Mead, Waite, Palmer, and scores of others, and this in spite of the fact that the book is intended merely as a key for identification of plants, not as a catalogue of the names of collectors with a list of their collections. Is it not established practice for a reviewer to read a book before he writes about it?

He goes on to say "in the new *Flora of Illinois* all personal genitives and all old generic names used as specific ones are decapitalized, in violation of good usage. . . etc. Why not tell the simple truth? In this book *all* specific and varietal names have been uniformly decapitalized in conformity with what the majority of present day biologists regard as the best usage. "Essentially all botanists of scholarly background, from Linnaeus down [to Fernald?] have shown their understanding by using the capital; it was regularly used, even by Rafinesque, and by Torrey, Engelmann, Gray, Britton, Small and Jones' usual model, Rydberg, while the very distinguished founder of the American Midland Naturalist, Nieuwland, was too great a scholar to decapitalize such names." All this amuses the intellect without fatiguing it. Those who are still uninformed should read the recent scholarly⁴ article by W. C. Steere in the March 1945 Bryologist, or the one by A. A. Beetle in Chron. Bot. 7:380-381. 1943.

One can always find fault with keys, and very often the writer of a key may be more keenly aware of its shortcomings than are the users. Certainly this is true in the present instance. If keys are not clear, then they are "too difficult," or "confusing." The opposite criticism is however leveled at some of the keys in this book. They are said to be "speciously simple." Perhaps Professor Fernald may have difficulty in distinguishing Hypoxis, Stenanthium or Zigadenus from grasses, sedges and rushes, but it can be scarcely supposed that most of the rest of us are similarly confused. Objection is made to the use of the word "enclosed" on line 1 of Section I, page 9, but it is to be noted that the same word is used in exactly the same sense in the key on page 11 of the seventh edition of Gray's Manual, and that key is certainly one of the items that was not copied from the sixth edition. Evidently a word used in the Manual "gets by," but when used in the same sense in another book, it doesn't! And as to the objection about the perianth of Juncaceae being "green," one may perhaps be pardoned for pointing out that the living plants contain chlorophyll, even in the perianth. The reviewer seems to have had particular difficulty with one section of the key to families. This key in its original form was published a quarter of a century ago. However, it should be pointed out in all fairness to the botanists who kindly permitted the use of the key in its present somewhat modified form, that the features to which Fernald specifically objects have been added in the present book. He asserts "Certainly if the barely shrubby *Hudsonia* can be placed (with apologies, to be sure) with the Gymnosperms, then bushy-branched, though herbaceous *Asparagus* could be placed there; and why not *Belamcanda* with its naked seeds or *Reseda* with its seeds maturing in an open-barrel-like capsule (*Reseda* is wild in Illinois, though not cited in the book). After struggling to the point of inaccuracy or near absurdity not to use technical terms, why give up and suddenly, in the keys, expect the ignorant beginner to understand "stamens hypogynous," etc.? *Hudsonia* is not "placed" with the Gymnosperms, neither are any apologies offered or implied; it is placed in the Cistaceae and is merely keyed out with the Gymnosperms on account of its subulate leaves and slightly frutescent habit.⁵ We are told, on p. 208, that "Scouring Rush (not a grass, sedge or rush) has no flowers." Presumably *Equisetum* is intended; if so, the reviewer should see p. 9 of the key "Group II, Ferns and fern-allies. Plants without flowers or seeds, reproducing by spores borne in sporangia." A wink is as good as a nod to a blind horse. Fernald

⁴ See footnote no. 3.

⁵ Speaking of keys, how does one "key out" a specimen of common buttercup, *Ranunculus* spp., or *Solanum* spp., in the key to families in the seventh edition of Gray's Manual? Fernald has solemnly reminded us that he had a hand in "revising the Manual."

asks why *Reseda* (mignonette), with its seeds "maturing in an open-barrel-like capsule" is not placed with the Gymnosperms! That is such an old gag it would scarcely deceive a freshman, yet, supposing it to be a fair question (as it is evidently intended to be), one wonders why *Reseda* was not placed among the Gymnosperms in the seventh edition of Gray's Manual. In another place, in an attempt to give the impression that still another important plant has been omitted, Fernald says "*Reseda* is wild in Illinois, though not cited in the book." Quite true; and the same may be said of sweet peas, rambler roses, peonies, potatoes and dozens of other plants. As to the accusation of having been "struggling to the point of inaccuracy or near absurdity not to use technical terms," I merely draw attention to the ten-page glossary of about 400 technical terms near the end of the book. Moreover, I was not consciously writing exclusively for the "ignorant beginner," as Fernald phrases it.

Something less than three pages of the "critique" are devoted to what appears to be a continuation of Fernald's long-standing grievance against A. S. Hitchcock (1865-1935), whose scholarly *Manual of the Grasses of the United States* (1935) is quite naturally the basis for the treatment of the Gramineae in the *Flora of Illinois*, and of other botanical books of the past decade. Except for the occasional modifications of nomenclature or taxonomy necessitated by recent critical researches it is better, in large and technical groups of plants, to follow uniformly throughout a standard monograph or manual, as Hitchcock's manual of grasses, and K. K. Mackenzie's monograph of *Carex*. On that account, most of Fernald's tentative name-changes in the Gramineae have been considered and rejected, especially in those genera, e.g., *Andropogon*, *Muhlenbergia*, and *Panicum*, which have happened to receive his passing attention. The appropriate procedure, it would seem, when extensive changes are contemplated is to put them in the form of a monographic study, not in casual notes or commentaries inserted in lists of plants from Virginia, for example. If the reviewer objects so strongly to Hitchcock's agrostological work, why hasn't he himself provided us with a manual of the grasses? We can well imagine that the pressure must have been rather strong to compel him six years ago to publish an article explaining why, after 30 years of preparation, his revision of Gray's Manual has not been completed!⁷

Possibly one of the most amazing parts of Fernald's review is that in which he purports to show that the "compiler" of the *Flora of Illinois* was not aware of the existence of Michaux's *Flora Boreali-Americana* (1803), and of the new species described from Illinois in that work. Fernald's statement is as follows: "Many of the names used in older reports are not now . . . known to the 'younger generation'; but they should be quite identifiable by anyone competent to rank as an authority on the flora. Even the great initial contribution of Michaux to our knowledge of the Illinois flora is quite ignored. . . . In fact, as already noted, more than 60 of Michaux's species had their types from Illinois. They were known to Lapham, Brendel and their really careful followers; but since, on the first page of the present *Flora* we are told that 'no comprehensive treatment of the botany of this state has hitherto been published,' it is just too bad that so much of the work of Michaux and so many records of his successors were not included and, by implication, not comprehended."

To quote Tom Sawyer, "Them statements is tough but interestin'" especially interesting when analyzed to see if Fernald is telling the truth. Following is a list of Michaux's "more than 60 new species," accompanied by the reference to their occurrence in *Flora of Illinois*. I leave it to the reader to judge whether Michaux's work has been "quite ignored," and whether or not his records have been "not included and, by implication, not comprehended." The book includes the names of more than 140 plants now growing in Illinois that were named first by Michaux. It is of course ridiculous to expect the insertion in a small local handbook of every "name-bringing synonym" or basonym, and moreover this is wholly unnecessary in view of the fact that we have the

⁶ See footnote no. 3.

⁷ Science, n.s. 89:329-332. 1939.

excellent three-volume *Illustrated Flora* of Britton & Brown, with its extensive synonymy and bibliography. As it is, the *Flora of Illinois* is weighted down with more than 900 synonyms!

Adelia ligustrina Michx.=*Forestiera acuminata*, Fl. Ill., p. 204; *Agrostis aspera* Michx.=*Sporobolus asper*, Fl. Ill., p. 59; *Agrostis lateriflora* Michx.=*Muhlenbergia mexicana*, Fl. Ill., p. 58; *Agrostis racemosa* Michx.=*Muhlenbergia racemosa*, Fl. Ill., p. 58; *Ambrosia bidentata* Michx., Fl. Ill., p. 247; *Ampelopsis cordata* Michx., Fl. Ill., p. 181; *Aristida oligantha* Michx., Fl. Ill., p. 60; *Asplenium angustifolium* Michx.=*Diplazium pycnocarpon*, Fl. Ill., p. 38; *Aster villosus* Michx.=*A. pilosus*, Fl. Ill., p. 255; *Capraria multifida* Michx.=*Leucospora multifida*, Fl. Ill., p. 229; *Carex typhina* Michx., Fl. Ill., p. 83; *Chloris curtispindula* Michx.=*Bouteloua curtispindula*, Fl. Ill., p. 61; *Coreopsis aristosa* Michx.=*Bidens aristosa*, Fl. Ill., p. 264; *Croton capitatus* Michx., Fl. Ill., p. 174; *Crotonopsis linearis* Michx., Fl. Ill., p. 174; *Dilepium minutiflorum* Michx.=*Muhlenbergia schreberi*, Fl. Ill., p. 58; *Eleusine mucronata* Michx.=*Leptochloa filiformis*, Fl. Ill., p. 61; *Erigeron divaricatus* Michx., Fl. Ill., p. 257; *Euphorbia thymifolia* Michx.=*Chamaesyce supina*, Fl. Ill., p. 175; *Festuca polystachya* Michx.=*Leptochloa fascicularis*, Fl. Ill., p. 61; *Gentiana puberula* Michx., Fl. Ill., p. 205; *Gerardia auriculata* Michx., Fl. Ill., p. 230; *Helianthus canescens* Michx.=*H. mollis*, Fl. Ill., p. 261; *Helianthus tomentosus* Michx., reported probably erroneously from Illinois; *Juglans olivaeformis* Michx.=*Carya illinoensis*, Fl. Ill., p. 106; *Leersia lenticularis* Michx., Fl. Ill., p. 62; *Leptanthus ovalis* Michx.=*Heteranthera limosa*, inadvertently omitted from Fl. Ill.; *Liatris aspera* Michx., Fl. Ill., p. 249; *Liatris cylindracea* Michx., Fl. Ill., p. 249; *Liatris spherioidea* Michx.=*L. aspera*, Fl. Ill., p. 249; *Mimosa glandulosa* Michx., and *M. illinoensis* Michx.=*Desmanthus illinoensis*, Fl. Ill., p. 161; *Monniera rotundifolia* Michx.=*Bacopa rotundifolia*, Fl. Ill., p. 228; *Pedicularis lanceolata* Michx., Fl. Ill., p. 231; *Petalostemum violaceum* Michx.=*P. purpureum*, Fl. Ill., p. 164; *Phacelus paniculatus* Michx.=*P. polystachyus*, Fl. Ill., p. 169; *Planera gmelini* Michx.=*P. aquatica*, Fl. Ill., p. 111; *Plantago aristata* Michx., Fl. Ill., p. 235; *Poa pectinacea* Michx.=*Eragrostis pectinacea*, Fl. Ill., p. 54; *Poa reptans* Michx.=*Eragrostis reptans*, Fl. Ill., p. 53; *Poa sesleroides* Michx.=*Triodia flava*, Fl. Ill., p. 54; *Polygonum ramosissimum* Michx., Fl. Ill., p. 116; *Prenanthes aspera* Michx., Fl. Ill., p. 271; *Prenanthes crepidinea* Michx., Fl. Ill., p. 271; *Quercus prinus* var. ϵ *tomentosa* Michx.=*Q. bicolor*, Fl. Ill., p. 111; *Rudbeckia pinnata* Michx.=*Ratibida pinnata*, Fl. Ill., p. 260; *Rudbeckia triloba* var. β Michx.=*R. subtomentosa*, Fl. Ill., p. 260; *Salix eriocephala* Michx.=*S. discolor*, Fl. Ill., p. 104; *Salsola platyphylla* Michx.=*Cycloloma atriplicifolium*, Fl. Ill., p. 120; *Scutellaria parvula* Michx., Fl. Ill., p. 218; *Silphium integrifolium* Michx., Fl. Ill., p. 259; *Silphium terebinthinaceum* Michx., Fl. Ill., p. 259; *Spermacoce glabra* Michx., Fl. Ill., p. 236; *Tagetes papposa* Michx.=*Dyssodia papposa*, Fl. Ill., p. 265; *Verbena bracteosa* Michx., Fl. Ill., p. 215; *Verbena rigens* Michx.=*V. stricta*, Fl. Ill., p. 216; *Verbesina helianthoides* Michx., Fl. Ill., p. 262; *Vernonia fasciculata* Michx., Fl. Ill., p. 247; *Vitis riparia* Michx., Fl. Ill., p. 181.

On p. 208 Fernald says: "Even the great initial contribution of Michaux to our knowledge of the Illinois flora is quite ignored, for such an obvious grass as *Bouteloua curtispindula* (Michx.) Torr. is credited to 'the n. half of Ill.' only, although the TYPE of the basic *Chloris curtispindula* Michx. was from Wabash." Fernald does not tell us where "Wabash" is. Michaux said "HAB. in aridis regionis Illinoensis ad Wabash et in ripibus ad prairie du rocher." At present we have records of this grass from 16 counties, none south of Lat. 40°. Hence the statement that the grass occurs in "the n. half of Ill." It would appear that once again Fernald has failed to prove his point. Anyway, it is by no means certain that Michaux's frequent phrase "in regione Illinoensi" always refers to localities within the present boundaries of the state of Illinois.

The following is an analysis of names of plants listed in E. J. Palmer's *Botanical Reconnaissance of Southern Illinois* (Journ. Arnold Arboretum 2:129-153, 1921). Fernald says of it: "Even one of the very latest papers . . . which, although cited, was apparently not carefully digested, would have yielded 28 additions to the *Flora*." What are the facts? Approximately 36 binomials and trinomials mentioned by Mr.

Palmer are not mentioned in Fl. Ill. These names, except those that are discussed on subsequent pages, are accounted for as follows:

Acer rubrum var. *tridens* quoad pl. Ill.=*A. rubrum*, Fl. Ill., p. 179; *Acer saccharum* var. *rugelii* and var. *schneckii*=*A. saccharum* sens. lat., Fl. Ill., p. 179; *Carya ovalis* var. *obcordata*, and var. *odorata*=*C. ovalis* sens. lat., Fl. Ill., p. 106; *Carya ovata* var. *nuttallii* and var. *pubescens*=*C. ovata*, Fl. Ill., p. 106; *Celtis occidentalis* var. *canina*=*C. occidentalis*, Fl. Ill., p. 111; *C. pumila* var. *deamii* and *C. pumila* var. *georgiana* quoad pl. Ill.=*C. pumila*, Fl. Ill., p. 112; *Crataegus fecunda*=*C. crusgalli*, Fl. Ill., p. 155; *Dianthera ovata*, no. Ill. spec. in herb. MBG.; *Hibiscus incanus* quoad pl. Ill.=*H. lasiocarpus*, Fl. Ill., p. 183; *Malus lancifolia*=*M. coronaria*, Fl. Ill., p. 155; *Parthenocissus quinquefolia* var. *hirsuta*=*P. quinquefolia* sens. lat., Fl. Ill., p. 181; *Rosa dasistema*=*R. palustris*, Fl. Ill., p. 154; *R. gallica* is a garden escape, not established in Ill.; *R. rudiusscula* quoad pl. Ill.=*R. carolina*, Fl. Ill., p. 154; *Rubus rubri-setus* quoad pl. Ill.=*R. flagellaris*, Fl. Ill., p. 153; *Salix cordata* var. *myricoides* is supposedly the hybrid *S. cordata* × *sericea*; *S. humilis* var. *rigiduscula*=*S. humilis*, Fl. Ill., p. 104; *Spilanthes americana*, no Ill., spec. in herb. MBG.; *Talinum calycinum*, no. Ill. spec. in herb. MBG.; *Vaccinium arboreum* var. *glaucescens*=*V. arboreum* sens. lat., Fl. Ill., p. 200; *V. virgatum* var. *tenellum*, no. Ill. spec. in herb. MBG.; *Vitis rupestris* quoad pl. Ill.=*V. riparia*, Fl. Ill., p. 181.

Most of the pages of Fernald's critique are taken up with "A partial supplement to the 'Flora of Illinois,' made from a desk-top in Massachusetts." The following corrections and emendations are made from living plants and herbarium specimens in Illinois. The items fall into the following four classes:

I. Plants said (or implied) to have been omitted from the book, but which are actually included, with or without citation of synonymy. As pointed out previously, binomials commonly regarded as synonyms have been usually treated as such, since it is neither necessary nor desirable to be continually re-listing them, especially in a small handbook.

Agrostis hyemalis (Walt.) BSP. appears to be the correct name for the Illinois species indicated on p. 57, Fl. Ill. as *A. scabra* Willd., in spite of the fact that apparently Lapham, Babcock, Patterson, Flagg, Brendel, Huett, and Higley & Raddin thought otherwise. See Hitchc., Man. p. 337 and 381. On p. 208 of the review Fernald says "Incidentally, followers of the new *Flora* should be warned against untenable specific names there used." An example of an untenable specific name is to be found on p. 90, Fl. Ill., where, as a result of following the wrong "culture-hero" (see line 10 from bottom of page 212 of review), *Juncus tenuis* Willd. was misnamed *J. macer* S.F.Gray (see *Rhodora* 47:117-123. 1945).⁸ Rydberg, Fl. Pr. & Pl. p. 208 (1932), has the plant correctly named.

Apios americana var. *turrigera* Fern. On the basis of the Clokey and Waite specimens cited by Fernald (p. 216), as well as many other collections, this is included with *A. americana* Medic., which is listed on p. 169, Fl. Ill.

⁸ For another example of useless name-juggling, useless because there is no real biological research behind it, see *Rhodora* 36:23-24. 1934; and then read W. T. Penfound's paper, *The Biology of the American Lotus* in Am. Midl. Nat. 31:744-758. 1944, especially the description of the corolla on p. 748.

Much of the current Fernaldian name-changing seems to fit into what the late W. B. Grove, eminent British mycologist, characterized as "floundering amid the multitudinous meticuliosities of Nomenclatorialism," which he defines as "An intricate esoteric art which strives to affix to every living creature (plant or animal) a definite unchangeable Latin label in strict accordance with the very latest views about Scientific Nomenclature. The object of the art was to reach finality; but it has not attained that end, nor can it, so long as the multiplicity of nature is rivalled by the variety of men's minds. A naturalist should take heed lest he become too nomenclatorialistically minded."—British Stem- and Leaf-Fungi, vol. 2, p. 367. 1937.

Carya megacarpa Sarg. is regarded as a synonym of *C. glabra* (Mill.) Sweet which occurs on p. 106, Fl. Ill. The Schneck collection (Univ. Ill. herb.) upon which Sargent's record was based is clearly *C. glabra*.

Carya pecan (Marsh.) Engler & Graebn. is a synonym of *C. illinoensis* (Wang.) K. Koch and is so listed on p. 106, Fl. Ill.; cf. Rehder in Journ. Arnold Arboretum 22:571. 1941; and E. L. Little in Am. Midl. Nat. 29:501, 1943.

Commelina diffusa Burm.f. The Vasey specimen (Univ. Ill. herb.) from Mound City was referred to *C. communis* L. which is included on p. 88, Fl. Ill.

Commelina crispa Woot. (not Woot. & Standl., as Fernald erroneously writes it) is regarded as a synonym of *C. erecta* L., and is so listed on p. 88, Fl. Ill.; cf. F. W. Pennell, Bull. Torr. Bot. Club. 43:407. 1916.

Echinochloa pungens (Poir.) Rydb.; *E. muricata* (Michx.) Fern.; *E. pungens* var. *microstachya* (Wieg.) Fern. & Griscom. Fernald says "Although Hitchcock (therefore the *Flora of Illinois*) could not see the specific characters which sharply separate the . . . etc." This subject has been discussed before, but it may be worthwhile to quote Hitchcock's conclusions: *Echinochloa muricata* (Michx.) Fernald is differentiated by Fernald from *E. crusgalli* by the stiff hairs arising from papillae on the spikelets, true *E. crusgalli* as he understands it having hairs that lack the papillose base. The author has been unable to separate *E. muricata*, the European specimens having on the average as strongly tuberculate spikelets as Michaux's specimens."—Man. p. 693. On the basis of study of 107 herbarium sheets and numerous living plants, I have been forced to accept the conclusions of Hitchcock, not Fernald, and the result is printed on p. 67, Fl. Ill.

Eleocharis wolfii is included on p. 72, Fl. Ill.

Erianthus brevibarbis Michx. is the name that Fernald prefers to apply to *E. alopecuroides* (L.) Ell., included on p. 68, Fl. Ill. In *Rhodora* (June 1943) Fernald used seven or eight pages in an endeavor to show that Hitchcock was in error, and that Michaux's specimens, although said in the original publication to have come from "Tennessee and Carolina," really were collected in southern Illinois. That may, or may not, have been the case.

Fagus grandifolia Ehrh. var. *caroliniana* (Loud.) Fern. & Rehder. "The tree of southern Illinois is so distinct from the true northern *Fagus grandifolia* that it stands well apart." If so, why is it treated as a "variety"? See map showing range of *F. grandifolia* by Transeau in Ecology 16:429. 1935.

Festuca tenella Willd. is a synonym of *F. octoflora* Walt., and is so listed on p. 51, Fl. Ill. See Hitchcock Man., pp. 61 and 859; Gray's Man. (ed. 7) 161. 1908; Abrams, Ill. Fl. Pac. States 1:217. 1923; Rydb., Fl. Pr. & Pl. 125. 1932; Small, Man. Se. Fl. 133. 1933.

Fraxinus biltmoreana Beadle is discussed on p. 204, Fl. Ill.

Leptochloa attenuata Nutt. is a synonym of *L. filiformis* (Lam.) Beauv.; cf. Hitchc., Man. 473, 878.

Lysimachia hybrida Michx. is a synonym of *L. lanceolata* Walt., which occurs on p. 202, Fl. Ill.; cf. Britt. & Brown, Illustr. Fl. 2:590. 1896, also ed. 2. 2:714. 1913. In 1937 Fernald (*Rhodora* 39:438-442) attempted to restore *L. hybrida* to specific status, but it does not necessarily follow that everyone else is compelled to agree with him. A. Gray had previously treated it as a variety.

Malaxis brachypoda (A. Gray) Fernald. "*Microstylis monophyllos* sensu e. Am. auth., not (L.) Lindl. 'Swamps. Menard County, Brendel; Elgin, Kane County, Vasey'—Patterson Cat." These references apply to *M. unifolia* Michx. included on p. 100, Fl. Ill. One might have supposed that Fernald would have been content to omit any further reference to this plant. See Bot. Mus. Leaflets, Harvard Univ. 6:169-183. 1938.

Malaxis brachypoda is a northern plant. It is not attributed to Illinois by Ames, Enum. Orchids U.S., p. 79, 1924. It is excluded from Indiana by Deam. Since I have seen no Illinois specimens, this species is not included in the *Flora of Illinois*.

Myriophyllum exallescens Fern. is included as a synonym of *M. spicatum* on p. 192, Fl. Ill. It was originally reduced to synonymy by the writer in 1936 (Univ. Wash. Publ. Biol. 5:199). It may be specifically distinct from the gerontogean *M. spicatum*, as Fernald contends, but it is at best a rather "weak" species.

Naias gracillima (A.Br.) Magn. The Schneck specimens (Univ. Ill. herb.) are *N. flexilis* (Willd.) R. & S. (Fl. Ill., p. 42). Neither Clausen (Rhodora 38:338-341, map 3, 1936), nor Muenscher (Aquat. Pl. U. S. 66, 67, 1944), who relied on specimens instead of statements in catalogues 60-75 years old, attributed *Naias gracillima* to Illinois, although, of course it may yet be discovered within the limits of this state.

Paspalum bushii Nash is not separable from *P. stramineum* Nash; cf. Hitchcock, Man. pp. 586, 922; also Palmer & Steyermark in Ann. Missouri Bot. Gard. 22:473. 1935.

Paspalum laeve Michx. The specimens cited by Mosher are *P. circulare* Nash (included on p. 63 of Fl. Ill.), and have been so identified by Agnes Chase. The type locality of *P. laeve* is Georgia. Apparently it occurs nowhere near Illinois. Deam (Fl. Indiana, p. 1029) says "This species has been reported but doubtless all reports should be referred to *Paspalum circulare* which was not reported and which occurs in the area from which the reports were made. The range of *Paspalum laeve* does not include Indiana." Fernald (p. 212) says "The great and wise soil-chemist, Hilgard, decrying the tendency of the uncritical majority to follow blindly and without careful checking the emanations from the government bureau which most concerned his field, used to refer to these uncritical flocks as being 'under the divine official afflatus of that head center.'" We wonder who is uncritical, and who has failed to do careful checking. A quotation from L. H. Shinnars, while working on *Panicum* (Am. Midl. Nat. 32: 177. 1944) may be appropriate here: "After reading his [Fernald's] paper, one feels that his pungent remarks, though often apt and to the point, have not been an adequate substitute for a full key or an extended discussion of the means of recognizing groups or separating closely related species."

Paspalum longepedunculatum LeConte. The wheel turns and the same old spoke comes up again. "Definite stations cited by Miss Mosher." But what about the specimens?

Paspalum setaceum Michx. (Type locality: South Carolina). Fernald says "Cited by Lapham, Patterson and most others, including Miss Mosher (with citation of specimens) but not by Jones." Has Fernald seen the cited specimens? This is what Miss Mosher says: "Many of the herbarium specimens of *P. muhlenbergii* [*P. setaceum*] examined were labeled *P. setaceum*, so it is quite possible that the citations above [i.e., Lapham, Patterson, and others] refer to both species." Deam, (Fl. Ind., p. 1029) says "There are several reports for this species [i.e., for Indiana] but doubtless all should be referred to some other species." Hitchcock (Man. p. 584) says: "... of or near the Atlantic Coastal Plain, Long Island to Florida and Texas: Mexico." That should be sufficient modern evidence for excluding the species from Illinois, altogether apart from the fact that the three specimens cited by Miss Mosher are *P. pubescens* (included on p. 63, Fl. Ill.), not *P. setaceum*. What did Fernald say about "culture-heroes"?

Poa wolfii Scribn. is included in Fl. Ill., p. 52.

Ptilimnium costatum (Ell.) Raf. Listed in Patterson's catalogue (p. 16) as "*Discolepleura capillacea* var.? *costata* DC." This is *P. nuttallii* (DC.) Britt., included in Fl. Ill., p. 197. *P. costatum* is a Coastal Plain species, ranging from Georgia to North Carolina.

Malus angustifolia (Ait.) Michx. has been several times attributed to Illinois but all

such records and all specimens seen are referred to *M. coronaria* (L.) Mill. Although, as Fernald says, it is listed by Patterson and by Schneck, *M. angustifolia* is not attributed to Illinois by Rehder (Man. Cult. Tr. & Shr. ed. 2), who says "Va. to Fla. and Miss." Deam, Trees of Indiana ed. 2, p. 183, says: "*Malus angustifolia* has been reported for the state, but it is a species of more southern range." It is not attributed to Missouri by Palmer & Steyermark.

Psoralea floribunda Nutt. is regarded as a synonym of *P. tenuiflora* Pursh, and is so listed on p. 164, Fl. Ill. On the basis of the characters mentioned on p. 215 of the review, *floribunda* would appear to have a rather tenuous status, even as a Fernaldian variety, although it should be noted that in this instance the variety was "made" by Rydberg.

Salix missouriensis Bebb is regarded as a synonym of *S. cordata* Muhl., which is included on p. 103, Fl. Ill.; cf. Britt. & Brown, Illustr. Fl. ed. 2, 1:596. 1913.

Scirpus rubricosus Fern. This is a new name proposed by Fernald (since the publication of Fl. Ill.) as a legitimate substitute name for *S. eriophorum* Michx., which he says is an illegitimate substitute name, but which is regarded as a synonym of *S. cyperinus* (L.) Kunth, included on p. 74 of Fl. Ill. In this species the spikelets are either stalked or sessile.

Smilax pseudo-china sensu auth. (includ. E. J. Palmer in Journ. Arnold Arboretum 2:139, 1921), non L., is *S. hispida* Muhl., included in Fl. Ill., p. 95. The Ridgway collection from Richland County is the same.

Sparganium angustifolium Michx. Had Fernald examined specimens as well as old catalogues he would have discovered that the Vasey specimens from McHenry Co. listed by Patterson belong to *S. americanum* Nutt., which is included in Fl. Ill., p. 42. I have seen no Illinois specimens of *S. angustifolium*; neither is it attributed to Indiana by C. C. Deam. Fernald says "One seeks in vain for any 'pattern' which may have governed the selection of species to be continued as admitted members of the *Flora of Illinois*, except the stated one that, for the most part, the author had personally examined them. . . ." Precisely!

Sporobolus canovirens Nash is a synonym of *S. clandestinus* (Spreng.) Hitchc. and is so listed on p. 59, Fl. Ill.; cf. Hitchcock, op cit. pp. 398, 958; Deam, Fl. Indiana, p. 135; Palmer & Steyermark, Ann. Cat. Fl. Pl. Missouri, p. 468.

Tephrosia holosericea Nutt. based on plants with leaves silky pubescent on both sides, is regarded as a synonym of *T. virginiana* (L.) Pers. which is included on p. 164, Fl. Ill. Both forms occur in the same habitat. See Britt. & Brown, Illustr. Fl. ed. 2, 2:372. 1913. The villous form is not even mentioned by J. K. Small (Man., Se. Fl. 1933).

Thaspium pinnatifidum sensu E. J. Hill, non A. Gray is *T. barbinode* (Michx.) Nutt. and is included as such in Fl. Ill., p. 197. This case furnishes an almost perfect example of the unreliability of Fernald's research methods. Why did he not examine the specimens? Surely taxonomic research calls for more than merely scanning ancient lists of plants!

Tilia floridana sensu Sargent, quoad pl. Ill., non Small; regarded as *T. americana* L. and included in Fl. Ill. on p. 181. E. J. Palmer in Journ. Arn. Arboretum 2:150. 1921 says "One tree referred to this species was found . . . near Grayville in White County." See B. F. Bush in Bull. Torr. Bot. Club 54:231-248. 1927, who does not attribute *T. floridana* to Illinois. Other specimens in Univ. Ill. herb. collected near Grayville by E. M. Mattoon in 1919 have been annotated by Bush as *T. glabra* Vent. (*T. americana* L.) and are so cited on p. 237 of his monograph.

II. List of names of plants attributed by Fernald to Illinois on the basis of references in old catalogues or other sources, but without supporting evidence from accurately

determined specimens collected in Illinois. These names were intentionally excluded from the *Flora of Illinois*.

Acalypha ostryaefolia Riddell. Not included in Fl. Ill. because no authentic Illinois specimens have been seen. The specimens cited by Patterson (Schneck; Vasey) as well as many others from southern Illinois are clearly *A. rhomboidea* Raf., which is included on p. 174, Fl. Ill. Although *A. ostryaefolia* may be found in Illinois, Fernald has supplied no evidence that it does occur.

Acer pennsylvanicum L. "Two stations near Chicago reported by Higley & Raddin." However, H. S. Pepon (1927) knew better than to copy this item. For a map of the total range of this species see E. N. Munns, Distr. For. Tr. U. S., in U.S.D.A., Misc. Publ. 287, map 146 on p. 150 (1938).

Amorpha fruticosa var. *tennesseensis* (Shuttlw.) E. J. Palmer, *A. fruticosa* var. *croceolanata* (P. W. Wats.) Schneid., and *A. nitens* Boynton, quoad pl. Ill., have been referred to *A. fruticosa* L., which is included on p. 164, Fl. Ill.

Carya arkansana Sarg. Excluded from Fl. Ill., because no authentic Illinois specimens have been seen. Fernald does not cite any.

Ceanothus americanus var. *pitcheri* T. & G. "Distinguished from the acute- or acuminate-leaved typical *Ceanothus americanus* (with leaves green and glabrous above) by its blunt or round-tipped leaves pilose above." (Fernald, p. 217 of review). Among the 54 sheets of Illinois material before me there is a complete intergradation from obtuse to acute and acuminate leaves, and from pubescent to nearly glabrous or quite glabrous upper surfaces of the blades. It appears that we are dealing here not with "geographical varieties" but with the results of simple ecological phenomena. I invite comparison between the following specimens: Evanston, June 26, 1896, *Agnes Chase*; Cicero, July 20, 1896, *Agnes Chase*; Makanda, June 16, 1903, *Gleason*; Fountain Bluff, July 28, 1917, *Cranwill*; Ottawa, *McDougall* 39; Miller, Indiana, *Lansing* 2766, and the specimens Fernald cites on p. 217 of his review.

Cerastium brachypodum (Engelm.) B. L. Robins. Attributed to Illinois by Britt. & Brown, but Fernald cites no Illinois specimens. *C. nutans* Raf. is common in Illinois, but I have seen no material of *C. brachypodum*. However since it is known in Missouri it may well occur also in Illinois.

Claytonia caroliniana Michx. No Illinois specimens seen. The records of "Patterson, Brendel, and Higley & Raddin" are all based on specimens of the common *C. virginica* L., which so far as I know, is the only species of *Claytonia* in Illinois. *C. caroliniana* is not attributed to Indiana by Deam, or to Missouri by Palmer & Steyermark.

Eriocaulon septangulare With. Inasmuch as there are in the Univ. Ill. herb. 21 sheets of this rare plant from adjacent counties of Indiana, and the fact that H. S. Pepon, who was a good observer of plants (even though in the later part of his life he seldom collected them), reported it from "East Chicago eastward" it seemed worth while to mention it in Fl. Ill. on p. 88, although as I said, no Illinois specimens have been seen. As Fernald has evidently only just discovered, East Chicago is actually in Lake County, Indiana, even though this may suggest "Illinois to those who do not know local geography,"—and apparently to some who learn it from infantile radio programs. The real point is that *Eriocaulon septangulare* has not yet been reported from Illinois, and for that there is no "apology."

Hydrocotyle americana L. "In Lapham's Catalogue; also listed by Higley & Raddin." What evidence is there that this species grows in Illinois? Pepon (1927, p. 410) says "Of doubtful occurrence." Not attributed to Illinois in the recent monograph of the Umbelliferae by Mathias & Constance in N. Am. Fl. 28B, p. 56 (1944).

Hypericum boreale (Britt.) Bickn. No Illinois specimens seen. I suggest that Professor Fernald study his material, especially the record from Richland County in southern Illinois.

Hypericum ellipticum Hook. No Illinois specimens seen. The specimens from "Athens" (if Athens, Menard Co., E. Hall in 1861 is intended) are clearly *H. mutilum* L., as is also the St. Clair Co. material collected by Brendel. The range of *H. ellipticum* is generally north of Illinois.

Fimbristylis baldwiniana Torr. Brendel's specimens from Peoria are *F. mucronulata* (Michx.) Blake, included in Fl. Ill., p. 72. Fernald attributes *F. baldwiniana* to Illinois because "there is characteristic material in the Gray Herbarium from eastern Missouri." What kind of reasoning is this? Perhaps the species may be found in Illinois, but Fernald has presented no evidence that it does occur.

Glyceria arkansana Fern. "The last epitome, Hitchcock's Manual, cites *Glyceria arkansana* only from Louisiana, Arkansas, and Texas." . . . a "sheet from northwest of Glencoe, Illinois (June 12, 1911, Sherff) seems to be it."—Fernald in Rhodora 40:386, 1938. *Glyceria arkansana* must have better "sustaining credentials" than that to be "admitted to the official registration." (See p. 208 of Fernald's review). The Schneck specimens from Wabash County (lemmas 4 mm. long) are clearly *G. septentrionalis* Hitchc., which is included on p. 52, Fl. Ill., although for reasons that should now be sufficiently obvious, *G. arkansana* Fern. is not included.

Glyceria striata var. *stricta* (Scribn.) Fern. is included with *G. striata* (Lam.) Hitchc., which is treated on p. 52, Fl. Ill.; cf. Hitchcock, Man. 90, 866. Not even under "Jones's rules" (see p. 210) is it eligible!

Heuchera americana var. *interior* and *H. richardsonii* var. *grayana*. The three Illinois species of this genus are accounted for on p. 145, Fl. Ill.

Ilex opaca Ait., "southern Indiana and Illinois—Sargent, Man. Trees N.A. ed. 2, 670 (1922)." As Fernald (p. 209) says "it is evident that something slipped." *Ilex opaca* was excluded from Fl. Ill. because no Illinois specimens have been seen. Neither Sargent nor Fernald have cited any. Sargent in the place cited does not even attribute the species to Illinois. Mr. Palmer says (in litt.): "Sargent seems to have accepted the record of *Ilex opaca* as occurring in Illinois on reports sent him by Robert Ridgway, who told me that he had the report from a neighbor who had told him that years before, he, with others, had crossed the river on a ferry from Cape Girardeau, Mo., and had camped in the bottoms on the Illinois side where the holly that he had known in Texas was abundant. I visited the locality and explored it thoroughly and also made enquiry of a number of people in the vicinity, but could find no trace or report of the *Ilex*. My report to Ridgway was that I believed that the farmer, who probably did not know much about plants, had mistaken *Viburnum rufidulum*, which was very common in the bottoms, for the holly, on account of its shining dark green leaves. I also followed up a report of *Acer pennsylvanicum* in the southern part of the state, and found that the trees were only forms of *A. saccharum*."

Juncus brevicaudatus (Engelm.) Fern. "Cited by Patterson from Kankakee County." No Illinois specimens seen. E. J. Hill's specimens are *J. canadensis* J. Gay which is included in Fl. Ill., p. 90. *J. brevicaudatus* is not attributed to Indiana; F. J. Hermann in Deam, Fl. Indiana, p. 302, says "Indiana is considerably south of the known range of *J. brevicaudatus*." It is not included for Missouri by Palmer & Steyermark. In 1904 (Rhodora 6:36) Fernald gave the range of "this northern plant" from "Newfoundland to the upper Saguenay, west to Minnesota, and south mostly in cold bogs, to the mountains of Pennsylvania." Not a word here about Illinois.

Juncus debilis A. Gray. Fernald says "Cited by Patterson from 'Southern Illinois.'" The exact quotation is "Southern Illinois, Vasey." The Vasey specimen is a depauperate plant of *J. acuminatus* Michx. One would suppose that Fernald knows that Illinois is wholly out of the range of *J. debilis*. Hermann, in Deam, Fl. Indiana, p. 320, gives the range as "R.I. to Fla., Miss., and Ark."

Linum floridanum (Planch.) Trel. No authentic Illinois specimens seen; not attributed to Indiana by Deam, or to Missouri by Palmer & Steyermark. Fernald says "north

to south Illinois." "Specimens without further data than 'Illinois' in Gray Herbarium." No comment necessary.

Mentzelia oligosperma Nutt. Although this was twice collected in western Illinois (Pike County) over seventy-five years ago, it has apparently not been seen recently, and was therefore intentionally excluded from Fl. Ill.

Muhlenbergia curtisetosa (Scribn.) Bush. Hitchcock (Man., p. 375) says "A little-known form . . . Illinois (Clinton), Missouri (Eagle Rock). It may be a hybrid." I have nothing to add to Hitchcock's statement; the name was therefore omitted from Fl. Ill. Fernald does not clarify *Muhlenbergia curtisetosa* in his discussion of certain of the species in Rhodora, June 1943.

Nuphar variegata Engelm. "A few specimens near South Chicago"—Higley & Raddin, p. 7 (1891), this record based on a collection by H. H. Babcock. Not attributed to Illinois by Miller & Standley in their monograph of the North American species (1912), or by Muenscher, (Aquat. Pl. U.S. 241. 1944), who notes that it is perhaps only a variety of *N. advena*. Probably now extinct in Illinois, although it occurs rarely in northern Indiana (fide Deam). Excluded from Fl. Ill. because no recent specimens have been seen.

Podostemum ceratophyllum Michx. "South Chicago, University of Chicago Herb."—Higley & Raddin, p. 100. The herbarium of the University of Chicago was turned over many years ago to the Field Museum of Natural History (now the Chicago Natural History Museum). There are no Illinois specimens of *Podostemum ceratophyllum* in that herbarium. Excluded from the Flora of Illinois because there are apparently no Illinois specimens in existence. N. C. Fassett, in his paper "Podostemum in N. Am.," Rhodora 41:525-529, 1939, cites no Illinois material.

Potentilla millegrana Engelm. No Illinois specimens seen, therefore the species not included in Fl. Ill. Fernald says "Illinois—Rydborg in N. Am. Fl. xxii.4 305 (1908)." However, in spite of this dictum from one of my "culture-heroes" (cf. line 10 from bottom of p. 212 of Fernald's review), I have excluded the species from the flora of Illinois until I see authentic specimens.

Smilacina trifolia (L.) Desf. "Patterson (1876), Brendel, and Higley & Raddin cite stations in northern Illinois." One may well ask, when Fernald was doing his literary researches on the flora of Illinois from a desk-top in Massachusetts, why he didn't take the trouble to read the following in Deam, Fl. Indiana, p. 1034:

"It possibly did occur about Lake Michigan [i.e., in Indiana] and may now be extinct. Butters, however, in his studies of *Maianthemum* (Minn. Studies in Plant Science 5:437. 1927) found 3-leaf forms of *Maianthemum* labeled *Smilacina trifolia*. This discovery suggests that the plants reported as *Smilacina trifolia* may have been wrongly determined. Buhl (Am. Midl. Nat. 16:251. 1935) says Pepoon's reports lack confirming specimens." Some of the older specimens (Brendel; Vasey) of *Maianthemum canadense* in the herbarium of the University of Illinois are labeled "*Smilacina bifolia*." If Fernald will accept modern evidence that *Smilacina trifolia* does not occur in Illinois he may see some in the latest monograph by D. H. Galway in Am. Midl. Nat. May, 1945, especially the map on p. 650, and the statement of range and the citations of specimens on pages 663 and 664. However, I have made no contract to help prepare an eighth edition of Gray's Manual! (See the comment on lines 4 and 5 from bottom of page 209 of the review).

Spiranthes lucida (H. H. Eaton) Ames. "In both cases called *S. latifolia*, thus apparently unrecognized by the author of the new Flora"—Fernald. Not unrecognized, but excluded for lack of specimens. E. J. Hill (in Bull. Torr. Bot. Club 26:306, 307, 1899) says "Perhaps there should be added to this northern list *Spiranthes latifolia* Torr., two specimens of which were found by Mrs. Agnes Chase of Chicago, growing on the bogs of springy ground near *Carex shortiana*. I am not aware of its occurrence elsewhere in this state except in Menard County, a station farther south." Not included by Pepoon (Fl. Chicago Area, 1927), or attributed to Illinois by Ames, Enum. Orchids

U.S., p. 94, 1924, or to Wisconsin by A. M. Fuller, *Orchids of Wisconsin*, p. 112 (1933).

Stellaria crassifolia Ehrh. The range of this is given in Gray's *Man.* ed. 7 as "... Lab. and Gulf of St. Lawrence to Ill., and northwestw.(Eu.)" On the basis of that statement one might be justified in expecting the plants to grow in Illinois, and perhaps in Okinawa as well. However, the fact remains that all Illinois specimens examined (including the Vasey specimen) belong clearly to *S. longifolia* Muhl.

Stipa avenacea L. "Lapham, in his very accurate study of the Grasses of the State of Illinois [real title: The native, naturalized and cultivated grasses of the state of Illinois] clearly described this species as growing in the state. Both his description and illustration are conclusive." Then Fernald says "Miss Mosher expresses the same view." What view? What Miss Mosher really said is "This species, commonly called black oat grass, appears to have been found in Illinois some time ago." Then she mentions the Lapham reference. But the significant fact is that Miss Mosher implicitly excludes *Stipa avenacea* from the present day grass flora of the state. Hitchcock (*Man. Grasses*, p. 428) does not attribute it to Illinois. It has been excluded from Fl. Ill. for the usual reason, namely, that no Illinois specimens have been seen.

Strophostyles helvola (L.) Ell., var. *missouriensis* (S. Wats.) Britt. Fernald says "The outright reduction of var. *missouriensis* to *S. helvola* can be justified only if one overlooks its coarser habit, much larger and unlobed blunt to merely acutish leaflets, etc. . . ." On the contrary it is only when these characters are taken into consideration that the outright reduction can be justified!

Stylosanthes biflora var. *hispidissima* (Michx.) Pollard & Ball, and *S. riparia* Kearney. All Illinois specimens examined belong to *S. biflora* (L.) BSP., included on p. 168, Fl. Ill.

Ulmus serotina Sarg. Excluded from Fl. Ill. because no adequate Illinois specimens seen. Not included for Indiana by Deam, or by Palmer & Steyermark for Missouri. Small gives the range as "Ga. to Ala. and Tenn." It is mentioned in Rehder's *Manual* (1940) on the basis (fide Professor Rehder in litt., May 8, 1943) of Gleason's specimen from Grand Tower, distributed as *Planera aquatica*. Professor Rehder said "Unfortunately the specimen is sterile and though it looks much like *U. serotina*, it may be wingless material of *U. alata*. . . . Flowering or fruiting material of this elm in the region cited should be collected again in order to make sure of the identity of this species." Has this been done? Fernald does not tell us.

III. List of names of casual weeds, and waifs, some of European origin, others cultivated plants, that have been deliberately excluded from the *Flora of Illinois*, even as (with one exception) they are excluded, or not even mentioned, in Deam's *Flora of Indiana*. There is no evidence that these plants are established members of the flora of Illinois.

Alnus glutinosa (L.) Gaertn. Fernald evidently wished to convey the impression that the European Black Alder is naturalized in Illinois, especially in Chicago. What are the facts? Since he has written (but not published) a paper on the subject we shall "wait and see."

Argemone intermedia Sweet. Native in western N. Am.; evidently a "railroad stray" (Pepoon) in Illinois. Recently observed in Henry County by Mr. Raymond Dobbs of Geneseo. Since Fernald evidently prides himself on his radio-acquired knowledge of the geography of Illinois would it be unkind to mention the fact that A. B. Seymour's 1878 specimen (Univ. Ill. herb.) came from Meredosia?

Callirhoe alcaicoides (Michx.) A. Gray. A casual adventive, apparently not seen in Illinois for nearly half a century.

Cardiospermum halicacabum L. Balloon-vine. Not uncommon in cultivation; "native of tropical America, and widely diffused as a weed in the warmer parts of the Old World."—Britt. & Brown, *Illustr. Fl.* ed 2, 2:501. 1913; "A native of the tropics,

sometimes cultivated for ornament northward, and escaping but not persisting."—Hitchc. & Standl., Fl. Distr., Columbia p. 201, 1919. Fernald makes the gratuitous assumption that this tropical plant is established in Illinois,⁹ since it is said to have been collected at Kaskaskia by Michaux, but that "it seems not to have been known by the very modern author of the *Flora*" !! (See Deam, Fl. Indiana, p. 1072).

Croton texensis (Klotsch) Muell. Arg. Although this has been several times attributed to Illinois I have seen no authentic specimens from this state.

Dianthus deltoides L. Maiden Pink. A garden plant, not naturalized in Illinois.

Geranium sibiricum L. Although in Gray's Manual (ed. 7, p. 535) this plant is "Said to be established on Manhattan I. (Adv. from Eurasia)," neither statement applies to Illinois, where the plant has been collected once.

Reseda alba L. Fernald says "*Reseda* grows wild in Illinois, though not cited in the book." It is pleasant to imagine his consternation, if he ever came to Illinois, on discovering that this is not really the Mignonette Belt, but the Corn Belt. He says "streets of Morgan Park—E. J. Hill. . . . And later records." How many later records? Anyway, since this plant is certainly not an established member of the flora of Illinois, it was "not cited in the book."

Sonchus uliginosus Bieb. A European weed which differs from the common *S. arvensis* L. principally in its glandless involucre bracts, was not included in Fl. Ill. for the simple reason that all material examined turned out to be *S. arvensis*. So far as I am aware *S. uliginosus* has never been attributed to Illinois, except by Fernald, who presents no evidence, although quite likely it may be found here. One factual statement about the actual occurrence of *Sonchus uliginosus* in Illinois would have carried more conviction than the remark "It is altogether too evident that here is another case of 'boom-town' construction, the big-fronted upper story constructed without serious consideration given the necessary foundations."

Spergularia marina (L.) Griseb. "Although the author of the *Flora of Illinois* especially cites (p. 287) Mrs. Rossbach's monograph, he drew no sustenance from it, completely omitting the genus *Spergularia* from the enumeration." Unfortunately for the success of Fernald's attempt to write a supplement to Fl. Ill. from a desk-top in Massachusetts, the Moffat[1] specimens (no. 283, Aug. 12, 1893, Univ. Ill. herb.) belong to *S. rubra* (L.) J. & C. Presl, not *S. marina* (L.) Griseb. Since the only known Illinois collection of this European plant was made more than half a century ago, *Spergularia* was "completely omitted from the enumeration." It is not attributed to Indiana by Deam, or to Missouri by Palmer & Steyermark.

Trifolium resupinatum L., the Strawberry Clover, native of the Mediterranean region, is not established in Illinois; neither does it persist in Indiana (see Deam, Fl. Indiana, p. 595).

IV. List of species actually known to occur in Illinois, but which were unintentionally omitted from the book. No discussion of these plants is necessary here, as they will be included with a list of additions and corrections soon to be issued.

Bergia texana, *Chamaelirium luteum*, *Corallorrhiza wisteriana*, *Cyperus virens*, *Descurainia sophia*, *Echinodorus tenellus*, *Eupatorium incarnatum*, *Heteranthera limosa*, *Hypericum petiolatum*, *Iresine rhizomatosa*, *Prunus munsoniana*, *Sabatia campestris*, *Salix wardeni*, *Scirpus hallii*, *S. heterochaetus*, *Strophostyles umbellata*, *Tragia cordata*.

Behold the results of Fernald's 15-page "critique." By this time it is clearly evident that his dramatic assertion that "fully 200 species" have been omitted from the "Flora of Illinois" is not supported by factual evidence.¹⁰ Fernald cites "more than 60 new

⁹ "It would be a pleasant thought, and by several enthusiastic Americans it has been urged, that we have an indigenous pansy in America."—Fernald in *Rhodora* 40:445. 1938. Ergo, why not an indigenous *Cardiospermum* in Illinois?

¹⁰ Yet Fernald says "Dramatic and unfounded statements have no place in real science; they belong in fiction."—*Rhodora* 46:20. 1944.

species" of Michaux, "28 additions" from Mr. Palmer's report, and a list of 36 other plants said to have been omitted from the book but which actually have been included; there is also a list of 34 names culled from old catalogues without supporting evidence from accurately determined Illinois specimens, and 11 names of casual weeds, waifs, and garden plants. Re-examination of these records shows, however, that in each instance these plants are included in the book, or else there is adequate basis for excluding them from the present flora of Illinois. Finally, there is a list of 17 rare or unusual species that might well have been included in the *Flora of Illinois*; but surely it was scarcely necessary for Fernald to use 15 pages, especially in these days of high cost of printing, to point out these 17 plants. Would it not have been more straightforward for the reviewer simply to have published this list of additional names, or perhaps, knowing that we are planning to publish a supplement, to have forwarded a list of them to the editor or to the author?

Nevertheless, we thank the reviewer for the time and trouble he has evidently taken to review the book. Inevitably, some species were omitted,¹¹ and perhaps a few others have been included on insufficient ground, but we think the reviewer should have drawn attention to the ninety or ninety-five per cent of the book that is useful. Despite his heroic labors, Fernald has been able to make an addition of only eight-tenths of one per cent to the number of authentic species in the *Flora of Illinois*. In other words, this very "incomplete flora of Illinois," so far as Fernald has been able to prove to the contrary in fifteen pages of small type, is more than ninety-nine per cent complete! We wonder how this would compare with the seventh edition of Gray's *Manual*? If "the *Manual*" was as much as eighty per cent or even ninety per cent complete, why has it been necessary for Fernald to expend nearly forty years and to fill hundreds of printed pages in an endeavor to patch it up?¹²

It is of course nowhere seriously suggested that the *Flora of Illinois* as published is anywhere near "complete," and statements to that effect were included in the Introduction on p. 2. Probably there are many species of vascular plants to be added to the flora of this state, but these will be added as a result of botanical research on the plants of Illinois, not by scanning old books on a desk in Massachusetts! Perhaps the author's modest hope, expressed on page 1, that publication of the *Flora of Illinois* might "serve to stimulate further interest in the local flora," may have been already partly realized. Small, compact and concise local floras have been the vogue in Europe for many years, and there is no good reason why we should not have similar books in the United States, despite the lugubrious lamentations and protestations of disgruntled critics.

¹¹ Of course there are some other species, such as *Carex intumescens*, *Panicum euchlamydeum*, *Spigelia marilandica*, etc. which have evidently escaped Fernald's attention.

¹² "... During the six summers up to 1939 . . . my companions and I have discovered 300 (at this writing fully 400) species new to the *Manual*; and at the present rate of such discoveries we look forward to 300 more."—Fernald in *Rhodora* 41:485, 1939.

DEPARTMENT OF BOTANY,
UNIVERSITY OF ILLINOIS,
URBANA, ILL.

Book Reviews

SPEED IN ANIMALS, THEIR SPECIALIZATION FOR RUNNING AND LEAPING. By A. Brazier Howell. University of Chicago Press, Chicago, 1944. xii+270, 55 figs. \$4.00.

The eminent anatomist-author of this work is well known for his general study of the convergent structures of aquatic mammals and for his succession of papers on the organs of locomotion in vertebrates. We may count it a great good fortune to have his mature consideration of locomotion in mammals crystallized in so attractive a book. The fruitfulness of the study of structure in relation to function is demonstrated in it. This approach to comparative anatomy is only relatively new; but it becomes steadily more evident that in its combination of renewed and more exact observation of the living animal with more exact and critical dissection, functional (or "biological") comparative anatomy becomes a vital discipline, with relations primarily with physiology, with ecology, and with ecological insights into paleontology.

The remarks on the locomotion of fishes, amphibians, reptiles, and birds occupy only 25 pages, and form merely an introduction to the more elaborate discussion of the overland locomotion of mammals. In a brief discussion of the monotremes and marsupials, the belief is expressed that the monotremes are derived from a quite different group of theriodont reptiles than are the remaining orders of mammals. The introductory chapter on placental mammals discusses successively the terrestrial orders Insectivora, Primates, Rodentia, Lagomorpha, Carnivora, Proboscidea, Perissodactyla, and Artiodactyla, as to their types of locomotion, leaping powers, and speed attainable.

The body of the work is occupied with a more detailed account of the mammalian locomotor mechanism, with chapters on muscular system, axial skeleton, arm, leg, and proportions. A special chapter is devoted to the analysis of gaits, based mainly on those of the horse. The chapter of conclusions consists of a great number of propositions derived from the author's comparative observations. These call attention both to the taxonomic peculiarities and to the functional relations of locomotor structures, e.g.: "The tibia lengthens in cursorial and shortens in graviportal specialization. The radius either remains the same or shortens less than the tibia in graviportals but lengthens as much as the tibia in cursorials." These proportions, drawn from a great amount of original dissection and observation, afford stimulating leads for further examination and test by functional comparative anatomy.

The main theme of the work is the mechanism of mammalian cursorial locomotion. Brachial arboreal locomotion, even of mammals, is not discussed, nor is swimming (except for brief introductory remarks), and since gliding and flying of mammals and birds is not mentioned, nor the gliding motion of snakes, some restriction of the title would have been desirable. The book would have been improved for the general reader by a tabular review of average and maximum speeds of the group considered. There is an all too brief index and an excellent list of literature cited.—KARL P. SCHMIDT, Chicago Natural History Museum.

BIRDS OF GEORGIA, A Preliminary Check-List and Bibliography on Georgia Ornithology. Compiled by Earle R. Greene, William W. Griffin, Eugene P. Odum, Herbert L. Stoddard, and Ivan R. Tomkins, with a Historical Narrative by Eugene E. Murphey. Occasional Publication No. 2 of the Georgia Ornithological Society, University of Georgia Press, Athens, Georgia, March 15, 1945. 111 pp., 1 pl., 1 map, \$2.00.

Georgia is one of the few states that up to the present time has had no complete authentic modern list of birds. This lack is now filled by the publication of the present annotated check-list. This, as its authors state, is not a complete work on the birds of the state, but is merely a preliminary list which will form the basis of a much more elaborate publication now in course of preparation.

The present publication consists of a brief Introduction, followed by a Historical Narrative which treats very well, though briefly, the persons who have contributed to our present knowledge of Georgia birds.

The main body of this publication is an Annotated Check-List of the Birds of Georgia, listed systematically. In this list there are 383 species and subspecies, but 8 species included in a Hypothetical List of 23 species which follows the main list should be added to the total of the Annotated List, making 391 birds for which there are valid records for the state. These 8 birds are here arbitrarily placed in a hypothetical list because no specimen of each was actually taken and preserved, although the records are admittedly correct.

A good Bibliography of 32 pages, arranged alphabetically by authors, brings together most of the important literature pertaining to the birds of the state.

An Appendix contains a list of Georgia ornithological societies and bird clubs, and a selection of the principal annotated local lists of Georgia birds that have appeared since 1900, although these are also included in the general bibliography.

An Ornithological Map of the state, on which are indicated the limits of the faunal areas, completes the book.

The only illustration is a frontispiece, which is a halftone reproduction of a painting of the Great Blue Heron by Athos Menaboni.

This list of the birds of Georgia will be a very useful publication for anyone interested in birds of this state, or in geographical distribution of the birds of North America. It has apparently been prepared with care and its records are therefore dependable. Migration dates and an index, both of which are lacking, would have added much to its usefulness.—HARRY C. OBERHOLSER, Cleveland Museum of Natural History.

THE MOLLUSCAN FAMILY PLANORBIDAE. By Frank C. Baker. Collation, Revision, and Additions by Harley J. Van Cleave. University of Illinois Press, Urbana, Illinois, 1945. xxxvi + 530 pp., 141 pls. \$14.50.

The present monograph is divided into two parts. Part 1 of 212 pages, embraces the topics 1) general morphology, 2) general ecology, 3) nidification and embryological development, 4) distribution in time and space, 5) historical sketch of classifications, 6) a new classification of the family Planorbidae, 7) systematic account of the subfamilies, genera, and subgenera—recent and fossil, 8) groups of uncertain affinities, 9) family Bulinidae, and 10) genera wrongly referred to Planorbidae. Part 2, comprises the Planorbidae inhabiting North and South America and the West Indies plus the illustrations concerning external and internal anatomy.

Although the major emphasis of this publication is on taxonomy, the above topics demonstrate it to be rather well-balanced by inclusion of information pertaining to fields other than that of classification. The work has been accomplished with such thoroughness and clarity of expression as to be of profound value not only to taxonomists, but also to ecologists, embryologists, morphologists, and parasitologists. The profuse and original illustrations are so superb and informative that those which are applicable should easily find their way into modern textbooks of zoology.

Taxonomically, Mr. Baker has divided the family Planorbidae into four sub-families, namely, Planorbinae with 12 genera, Segmentininae with 11 genera, Helisomatinae with 7 genera, and Planorbulinae with 4 genera. The family Bulinidae, which is usually considered a subfamily of the Planorbulinae is discussed but is excluded from the latter family on the bases of morphology of the pseudobranch and the shape of the penial complex of the male reproductive system. The genera *Nautilinus* and *Paleorbis* are cited as wrongly referred to the Planorbidae.

On the whole the volume is well done and merits a great deal of appreciation. The inclusion of information on the new species and varieties, in the morphological account would have augmented the work from a comparative standpoint. A few minor inconsis-

tencies and omissions which are not serious, occur in the index. No small amount of credit should go to Professor H. J. Van Cleave for his part in completing the present volume by collating and revising the original manuscript and by making a number of necessary additions. He must have spent many long hours of work with the reward of seeing a monumental work of one of his dearest friends, blossom into print.

It is sad that the author did not live to see his work published but I feel sure that it was no surprise to him for he wrote to the reviewer in 1938, "I shall try to finish up a lot of research work which I do not wish to be 'posthumous.' My Planorbidae is about completed as far as the anatomical work is concerned. But there is not a page of manuscript yet!"—JOHN D. MIZELLE.

FRAGMENTA PAPUANA [observations of a naturalist in Netherlands New Guinea]. By H. J. Lam. The Arnold Arboretum, Jamaica Plain, Mass. Sargentia 5: pp. 1-196, 2 maps, and 32 figs. \$3.00.

New Guinea remains one of the last terrae incognitae, a vast tropical land with unexplored forests, unvisited valleys, unclimbed mountains, and unknown wild tribes, beckoning to the scientific explorer with the lure of the new and undiscovered. The great scientific importance of New Guinea lies perhaps in the still obscure relations of its mountains with the Australian continent to the south, and the problems set by this relation require for their solution a renewed attack by botanical and zoological collectors, by geologists, and by anthropologists. Long-continued zoological interest has attached to the region an account of its magnificent birds-of-paradise and only little less showy bird-winged butterflies. The lead in the more truly scientific modern exploration of the New Guinean land mass has more recently fallen to the Dutch, as a glance at the three decades of their great publication "Nova Guinea" will demonstrate. Finally, the pre-war Archbold expeditions from the American Museum of Natural History, combined with the interest aroused by American expeditionary forces serving in the New Guinean campaigns, might be expected to result in continued post-war interest in this area on the part of American scientists.

The field notes of the Dutch botanist, H. J. Lam, made available in translation by Miss Perry, serve to remind us of the first rate importance of the explorations of the Netherlands East Indies government and of the desirability of full and cordial cooperation on the part of American institutions with Netherlands scientists and governmental agencies in any renewed program of studies on Netherlands New Guinea, as equally with Australian museums and scientists for Papua and the Territory of New Guinea. The days of intense museum rivalry should be over, and the accumulated collections and publications should be the foundation of a more scientific and more fully cooperative renewed attack on the problems clarified and posed by the preliminary work. This spirit is exemplified in the interest taken in Dr. Lam's work at the Arnold Arboretum.

The reviewer heartily concurs with Miss Perry's remarks about the present series of papers: "The botanical enumerations and descriptions are interspersed with a vivid and living journal covering the year which he spent in New Guinea. The summaries of his impressions, the faithful recording of details, the intuitive appreciation of beauty so well expressed in scenes of nature, and the variety of his observations: all these lend color and interest to this work." The importance of Dr. Lam's ecological observations on the tropical and subtropical forests will be evident from the examination of the several figures, which illustrate his remarks on the ecological organization of the forest. Likewise of great ecological and phytogeographic interest in his section on the Doorman top, at 3580 meters, which rises above the forest level.

The region visited by Dr. Lam has had much publicity on account of the Archbold Expedition's visit to the Baliem Valley, and the accounts of the same valley by air force personnel during the present war. The Baliem valley must be supposed to be typical of many such areas on the flanks of the New Guinean central range, and references to it as a "Shangri-La" are appropriate only to sensational journalism.—KARL P. SCHMIDT, Chicago Natural History Museum.

WEEDS OF LAWN AND GARDEN. A Handbook for Eastern Temperate North America.

By John M. Fogg, Jr. University of Pennsylvania Press, Philadelphia, 1945.
vi + 215 pp., illus. \$2.50.

In recent years more home-owners than ever before have turned to their flower gardens or available lots to raise common vegetables for immediate use. To assist them in this task, numerous books and pamphlets containing directions, descriptions and figures of vegetables, flowers, etc. were promptly published. But few authors thought of including sufficient information regarding the ever present weeds. Fortunately this gap is now filled by this eminently useful *Handbook* which promises to assume its rightful place next to the gardener's esteemed manuals. But it would be an injustice to the author to imply that this is the only use the book will find. For, in addition to the necessary details of description and recommendations for successful eradication, he included valuable observations concerning the appearance of seedlings of "weedlings" and their unconscious mimicry of certain cultivated plants. Consequently, drawings of these juvenile stages often differing markedly from the mature plants or of the basal rosettes of leaves are included in the excellent illustrations of the 175 weeds treated in this *Handbook*.

Introductory chapters deal with the "weediness" of some species, the important structural characters of weeds, their habits, requirements, modes of dispersal, geographical origin, weeds as soil indicators and, finally, methods for their extermination. Weeds are readily credited with remarkable powers of reproduction, germination, dispersal, and other properties. Yet it is no more possible to formulate a satisfactory definition of "weediness" than it is to recommend a foolproof method of control. But despite their bad reputation and noxiousness weeds are no less interesting to the botanist than are many other species of plants, in fact weeds frequently are superior experimental plants and have as such been widely used. Since the book was not prepared to serve as a manual but rather as a convenient guide of pocket-size format, the reader should be grateful for all the information presented in it and should neither expect to find an answer to all his queries nor a panacea for all problems. If he uses the book with this idea in mind, he will soon find indications of the author's strong botanical interest in these "undesirable" plants and the many unanswered questions which they pose.—THEO. JUST.

THE AQUATIC OOMYCETES OF WISCONSIN. PART ONE. By Frederick Taylor Wolf.

University of Wisconsin Press, Madison, Wis., 1944. 64 pp. 6 plates. \$1.50.

This small handbook describes the more conspicuous water molds that have thus far been collected in Wisconsin. The 55 species and forms recognized are distributed amongst six orders, seven families and 22 genera. The bulk of these are included in the Saprolegniales (36), Leptomitales (1) and Pythiales (13); two species of *Monoblepharis* and one each of *Allomyces*, *Lagenidium* and *Myzocyttium* complete the list. Eight pages of introduction summarize the taxonomic history of these fungi and describe the methods used in collecting and culturing them. One species of *Isoachlya* and one of *Aplanes* are listed as probably undescribed and their characteristics are given but they are neither named nor formally described and in several instances the author has refrained from proposing taxonomic changes where he suggests they may be desirable. The work was evidently completed before he entered military service, which would explain the omission of any reference to Sparrow's comprehensive monograph and also a few minor errors in phraseology and gender of specific names. The six plates include 52 simple, diagrammatic line drawings illustrating one or more representatives of all but one of the genera included. It is unfortunate that references to the illustrations have not been inserted in the text. In one case (*Myzocyttium*) the illustration is not in agreement with the text.

This modest book is obviously not intended to take the place of the standard works on the water molds. Since, however, many of the species described are common and of wide distribution, it should be of great service to teachers and students, especially to those to whom the more comprehensive and necessarily more technical monographs are not readily available.—G. W. MARTIN.

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